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CHAPTER 14.0 MINIMUM NURSE AIDE STAFFING REQUIRED TO IMPLEMENT BEST PRACTICE CARE IN NURSING HOMES[1]

14.1 Introduction

Nursing home (NH) staffing patterns evidence a heavy reliance on nurse aides to provide direct assistance to residents, and controversy exists about the nurse aide-to-resident ratio needed to provide good care. Unfortunately, the type of study that can most defensibly address this controversy has not yet been conducted. There is, however, sufficient evidence about selected care processes to estimate minimal resident-to-nurse aide ratios needed to provide care. Drawing on this evidence, this chapter concludes that inadequate staffing may exist in many nursing homes. The investigators arrive at this conclusion by addressing two fundamental questions:

- How much nurse aide time is required to implement five specific, daily care processes that have been linked to resident outcomes?

- Given that nurse aide labor resources vary among NHs, how might different levels of staffing effect the daily care that residents receive?

In the first section of this chapter, investigators review existing research evidence that identifies the amount of time nurse aides need to provide care that has been proven effective or has been cited as "best practice." This chapter focuses only on care processes that are performed by nurse aides, have been specifically defined (i.e., the steps involved in providing care have been detailed), and have been linked through research evidence or expert consensus to outcomes that have both clinical and quality-of-life implications. Given the chapter's focus on best practices, this specific process-outcome link is required for a care process to be included in the outcome analyses.

In the second section of this chapter, innvestigators use operational research models to project the number of residents who are likely to receive efficacious care processes under various staffing scenarios. These models are based on data and reasonable assumptions about critical input variables needed to project the outcomes of different staffing ratios.

There are three critical input variables:

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1. The amount of time nurse aides have available to provide direct care, which includes care processes linked to improved clinical outcomes as well as other routine care processes that are necessary but may not be linked to a specific clinical outcome (e.g., answering call lights).

2. The frequency with which the need for an efficacious care process arises and the number of residents who need it.

3. The time needed to provide each episode of efficacious care.

With this information as input, the operations models will provide as output:

1. Estimates of the difference between the care activities that should occur if improved outcomes are to result and the number that actually do occur given the staffing model being tested.

2. Staffing ratios that are most likely to result in desirable clinical outcomes.

In order to model the effects staffing ratios have on the care delivered, investigators needed to make assumptions about the efficiency with which services are provided. An important output of the investigators' analysis is an estimate of the minimum number of staff necessary to complete care for all residents based on the three input variables listed above. Investigators therefore chose to make the conservative assumption that work is scheduled for maximum time efficiency as opposed to individualized care scheduling (i.e., providing care that varies based on resident preferences). The investigators' minimal staffing scenarios also resulted in a very high (perhaps unrealistically high) nurse aide work productivity. Given their assumptions, the investigators simulated estimates of minimal staffing should be regarded as a low bound on the number of staff required in real NHs, where the efficiency and productivity may be less than optimal. The rationale for the investigators' approach, as well as its limitations, is more thoroughly discussed in the "Limitations and Future Directions" section 14.14 of this chapter.

While investigators estimated the minimum number of staff necessary to provide care under conditions of high efficiency and productivity, the investigators did not identify specific ways for better managing nurse aides so as to encourage either high productivity or efficiency. Nurse aide productivity could probably be enhanced with better management, including increased supervision from licensed nurses, more in-service training for aides, and management training for those who supervise them — a hypothesis that the investigators strongly believe should be tested under controlled conditions. Unfortunately, due to lack of data, investigators are unable to estimate the effect of using professional nurse management in the staffing models they are analyzing.

Investigators also note that they are not making a distinction between quality of care and quality of life in their choice of the care processes analyzed in this chapter for two reasons. First, even though the outcomes that these processes improve have high relevance to both academic definitions of quality of life (e.g., resident independence) and clinical outcomes (e.g., continence), investigators do not believe that these constructs should be arbitrarily separated. For example, incontinent residents report that timely toileting assistance is a valuable care process, and the extent to which such assistance decreases wetness rates (e.g., clinical outcome) or improves resident satisfaction (e.g., quality-of-life outcome) should not be separated. Second, most of the care protocols that investigators are evaluating describe interpersonal communication processes as a vital aspect of the care practice. There is evidence that residents value such interpersonal processes, independent of the outcomes such care produces. For example, the prompted voiding protocol that has been linked to the outcome of continence involves communication steps designed to give the residents personal control over their toileting assistance. Investigators, thus, believe that the staff time costs reported in this chapter for implementing care processes deemed "best practices" include the time to interact with a resident in a manner consistent with high standards of both technical (e.g., rendering toileting assistance) and interpersonal (e.g., social communication) care quality. This point will be further elaborated in the discussion later in this chapter in the section "Limitations and Future Directions."

14.2 Identification of Care Practices

This paper projects the staffing resources required to implement care practices that have been linked to improved outcomes and are under the control of nurse aides. Investigators make no judgements about how appropriate it is to charge nurse aides with these care responsibilities; the investigators intent is simply to reflect current NH practice.

Investigators developed the following criteria to select care practices for analysis:

1. The care process must be specifically designed.

2. The care process must be primarily implemented by non-licensed direct care staff given current NH staffing practices.

3. There must be evidence that a care process meeting the first two criteria changes a specific outcome when implemented.

4. There must be expert consensus that the care process reflects high quality NH care.

5. Assuming a care process meets criteria 1 through 4, there must be information regarding the amount of time needed to implement it.

Investigators then reviewed research literature, practice guidelines developed using expert consensus methodologies, and the quality indicator literature, using several search strategies to identify care practices that might meet their criteria. Investigators first searched the following databases: Medline, Healthstar, Embase, and Ageline, using combinations of these key words: nursing homes, best practices, daily care/activities, nurse aides, workload, nursing care, time factors, incontinence, pressure sore, nutritional care/feeding behaviors, mobility, exercise, activities of daily living/independence, behavior management, agitation, mood. With this approach, investigators identified approximately 950 articles, which they narrowed down, based on a review of their abstracts, to about 200 for more thorough review. Because practice guidelines and quality indicators are seldom referenced in the traditional scientific databases, investigators used a number of other search strategies to locate these materials. They searched the following sources: Directory of Clinical Practice Guidelines, Guide to Clinical and Preventive Services, National Guideline Clearinghouse, National Library of Healthcare Indicators, and The Medical Outcomes and Guidelines Source Book.[1,2,3,4] Investigators specifically reviewed all guidelines developed by the American Agency for Healthcare Policy and Research and the American Medical Directors Association because of their obvious relevance to NH care.

The investigators' ability to identify relevant practice guidelines was facilitated by a recently completed project at the RAND Corporation designed to develop quality indicators for NH care. The Assessing the Care of Vulnerable Elderly Project (ACOVE) conducted comprehensive literature reviews, including a review of relevant practice guidelines, for the purpose of identifying process outcome relationships, which content experts then constructed into a series of quality indicators using an "IF/THEN" format. The following example illustrates this format:

> **IF** a nursing home resident incapable of independent toileting is assessed and found capable of appropriately using the toilet over 65% of the time,
> **THEN** the resident should be placed on a toileting assistance program
> **BECAUSE** the resident will maintain continence as long as the program is implemented consistently.
>
> **Summary:** Toileting assistance interventions have proved efficacious in multi-site controlled clinical trials with nursing home residents who are incapable of independent toileting. It has been difficult to implement these care protocols in daily nursing home practice because of data accuracy and labor intensity barriers.

A panel of nine experts in NH care evaluated each indicator on a nine-point scale for: (a) Validity (Is there evidence of a process-outcome link?), (b) importance (Would this process significantly impact the quality of NH care if it were implemented?), and (c) feasibility (Can a typical NH be expected to implement the process?). Indicators with a median rating of seven or higher for validity, importance, and feasibility were accepted as an indicator of NH quality. In this way, the expert panel approved 280 NH indicators, out of a total set of 479 choices for quality indicator content and wording. Twenty-

two of these indicators involve care processes that are under the control of nurse aides (e.g., toileting and changing, feeding assistance, repositioning, ADL independence enhancement, and exercise). In the literature review that follows this section, investigators describe in more detail these indicators. Henceforth, investigators will refer to these indicators as the "ACOVE indicators."

Ultimately, investigators identified five care processes that met their criteria and are needed by the majority of NH residents, as will be documented in the "Literature Review" section of this chapter. These processes represent a reproducible consensus-based subset of the tasks nurse aides might provide while caring for NH residents even though the five care processes are obviously not a complete list of what nurse aides must do.

- Repositioning and changing wet clothes
- Repositioning and toileting
- Exercise
- Feeding assistance
- ADL dressing independence

Reluctantly, investigators excluded interventions designed to reduce agitation or improve mood as well as interventions that reportedly improved independent functioning in ADL areas other than dressing, feeding, and toileting. The justification for excluding these interventions is arguable in some cases. The investigators explain their decisions later in this chapter.

It should also be noted that the five care processes selected for analyses include processes that are recommended for restrained residents; that is, releasing residents every two hours to provide incontinence care, repositioning, and mobility exercise. Investigators have not, however, included a separate set of care processes for managing or preventing restraint use despite reports that restraint use has been significantly reduced in NHs with training/consultative interventions.[5,6] Unfortunately, these studies did not report what specific care processes were changed to produce improvements in restraint use and there is no information about how much time aides spent caring for residents during time periods either before or after restraints were reduced.

It is noteworthy that several articles that investigators reviewed in content areas outside of restraints also reported that training interventions produced significant changes in outcomes, without documenting the care process that changed after training that led to the improvements.[7,8] In particular, one study reported that nurse aide training prevented ADL decline in multiple areas as measured by the MDS.[7] This finding is surprising given that other literature suggests that care processes which improve ADL independence are very labor intensive. In two studies, for example, nurse aides specifically reported that time was a barrier to implementing care processes known to improve independence.[9,10] In contrast to these studies, the training intervention study suggests that NHs are adequately staffed to improve ADL outcomes if employees are trained and that time is not a barrier to implementing efficacious care

processes.

Investigators believe that all studies that report that better training is sufficient to produce improved outcomes should be replicated, with specific attention to documenting the care processes that led to these improved outcomes. It would be particularly important to note what management or incentive initiatives led to the sustained application of the new care processes that were the focus of training. In any case, the absence of specific process data, particularly data about nurse aide care behavior, forced us to exclude a number of studies from the analyses conducted in this chapter.

14.3 Review of Literature Describing Process-Outcome Relationships and Labor Requirements

14.3.1 Repositioning and Incontinence Care

Investigators integrated repositioning with an incontinence protocol on changing wet linens and analyzed it separately from an integrated care process based on repositioning and toileting. The reasons for both the integration and the separate analyses of the two sets of processes are as follows:

1. Repositioning and incontinence care (either toileting or changing), both recommended to prevent skin problems, logically should not be separated in practice. It would be inefficient, for example, to reposition incontinent residents without changing them if they are wet or toileting them if they request assistance.

2. One incontinence protocol will not work for all incontinent residents. Studies show that only 33% to 50% of incontinent residents are good candidates for daytime toileting programs and fewer are responsive to nighttime toileting programs.[11,12] Also, the toileting care process is more time intensive than either changing or repositioning.[13] Thus, it is necessary to evaluate the repositioning protocol that includes toileting separately from the repositioning process that involves changing, at least during the daytime.

14.3.2 Repositioning and Changing Processes

Two separate practice guideline panels have recommended a repositioning program for residents at risk for pressure sores based on their review of the research literature and expert opinion.[14,15] For example, "the practice guideline panel for the Agency for Health Care Policy and Research (AHCPR) made two recommendations relevant to repositioning:

- "Any individual, in bed, who is assessed to be at risk for developing pressure ulcers should be repositioned at least every two hours if consistent with overall resident goals.

A written schedule for systematically turning and repositioning an individual should be used."[14]

- "Plans for positioning of chair-bound individuals in chairs or wheelchairs should include consideration of postural alignment, distribution of weight, balance, strength, and pressure release. It is furthermore recommended that a written plan for the use of positioning devices and repositioning schedules may be helpful for chair-bound individuals."[14]

With respect to incontinence management, the recommendation of the AHCPR practice guideline panel is as follows: "Minimize skin exposure to incontinence, perspiration, or wound drainage. When these sources of moisture cannot be controlled, underpads or briefs that are made of materials that absorb moisture and present a quick-drying surface to the skin may be used."

Supporting the validity of the practice guideline recommendations, the ACOVE consensus panel, charged with evaluating indicators to assess NH quality, approved the following indicator: "If a risk assessment score indicates that a resident is 'at risk' for pressure ulcer development, then a preventive intervention should be instituted that addresses pressure reduction and the resident's repositioning needs because reducing or eliminating risk factors can prevent pressure ulcer formation."

This widespread acceptance of repositioning and changing programs by multiple expert consensus panels is based on extensive indirect and limited direct evidence. Two studies reported a relationship between spontaneous body movement and the incidence of pressure ulcers or other skin conditions, but only one of these studies evaluated the effects of an intervention that increased body movement.[16,17] This uncontrolled study reported beneficial effects on pressure ulcers when residents were turned every two to three hours.[16] Supporting the hypothesis that incontinence and infrequent body movement are risk factors for pressure ulcers, a third prospective study demonstrated that a subject's score on the Braden Skin Risk Assessment Inventory, which includes incontinence and mobility rankings, is predictive of pressure ulcer development.[18]

With regard to the importance of incontinence management, one study reported a positive relationship between the frequency of urinary or fecal incontinence and skin conditions associated with pressure ulcer development.[17] This study suggested that more timely changing or toileting of incontinent residents might reduce the deleterious effect of skin wetness and fecal exposure on skin health. In support of the hypothesis that skin wetness exacerbates skin problems, the AHCPR consensus panel on pressure sore prevention reviewed four studies that found that absorbent materials, which minimize the skin's exposure to wetness, reduced the incidence of skin irritations.[14] Unfortunately, no controlled study has documented the effect on skin conditions of an intervention that combines better repositioning and incontinence care. One uncontrolled study, however, showed positive intervention effects. This study reported significant reductions in the incidence of pressure ulcers following implementation of a

multifaceted protocol, which included more frequent repositioning. The study, however, did not specifically describe how much the repositioning care process changed from baseline to intervention. [19]

The importance of incontinence management is further underscored by evidence that NH residents value the timely changing of wet linens. Residents interviewed in one study reported a preference to be changed two times per eight-hour period, and consumer focus groups have consistently reported that they value timely toileting and changing assistance.[20, 21]

14.3.3 Repositioning and Toileting Process

Two separate practice guidelines have recommended toileting assistance programs as a treatment process for NH residents.[22,23] The AHCPR practice guidelines for urinary incontinence in adults present the following recommendation: "Prompted voiding is recommended in residents who can learn to recognize some degree of bladder fullness or the need to void or who can ask for assistance or respond when prompted to toilet. Residents who are appropriate for prompted voiding may not have sufficient cognitive ability to participate in other more complex behavioral therapies."

Two quality indicators developed by the ACOVE project reinforce the importance of both toileting assistance programs and an assessment protocol for identifying responsive residents for these programs. The first of these two quality indicators is: "If a NH resident incapable of independent toileting is assessed and found capable of appropriately using the toilet over 65% of the time, then the resident should be placed on a toileting assistance program because the resident will maintain continence as long as a program is implemented consistently." The correlated diagnostic or assessment quality indicator recommendation is: "If a NH resident continues to be incontinent after transient causes of incontinence are treated, then the resident should be placed on a three- to five-day toileting assistance trial because this assessment is predictive of long-term responsiveness to a toileting assistance program." It is noteworthy that even though these indicators exceeded the median ratings necessary for acceptance on validity and importance criteria (7 on a 9-point scale), they were rated as only marginal on their feasibility of implementation in a typical NH because of the panel's concerns about staffing limitations.

There is strong direct evidence that toileting assistance programs reduce incontinence. Four controlled trials have tested toileting assistance programs for NH residents. Three studies, with a combined total of 289 subjects, reported a 25%, 30%, and 50% decrease in incontinence frequency in their intervention groups compared to the subject's baseline levels, as well as significant differences between the intervention and control groups. The fourth study, with 88 subjects, reported that 86% of the treatment group showed improvements, with 30% reducing their incontinence frequency by 25%. The control group showed no significant change in incontinence frequency. [24,25,26,27]

As reported earlier in this chapter, there is strong evidence that only 33% to 50% of NH residents are good candidates for toileting assistance programs. Two separate studies reported that 40% and 41%

of residents who participated in a prompted voiding trial significantly improved their dryness and appropriate-toileting rates.[11,12] The remaining subjects in these trials did not show significant improvement, so it was recommended that they be managed with a timely changing program. Studies also show that residents who are responsive to toileting assistance programs can be identified in a three-day assessment period. A validated assessment protocol already exists for efficiently identifying such residents.

In addition to this clinical evidence, there is also evidence that residents value toileting assistance. One recent study reported that NH consumers prefer assistance with toileting two to three times per day when they are out of bed.[20] A second study reported that NH residents prefer consistent toileting assistance to other "perks" such as private rooms and better food.[28]

In sum, there is strong evidence that residents value daytime toileting programs and that such programs effectively improve dryness outcomes during their implementation (typically between 7:00 a.m. to 7:00 p.m.).

More recent evidence suggests that incontinence care during he night must be conducted differently than during the day. Two studies documented that incontinence care routines, as they are typically conducted in NHs, disrupt residents' sleep, and one study reported that a nighttime toileting assistance program was significantly less effective than a daytime program.[29,30,31] This reduction in effectiveness occurred even for those residents who were highly responsive to a daytime toileting assistance program.

Acknowledging the importance of sleep in the overall health and quality of life of NH residents, one recent study recommended that incontinence care be individualized at night based on a resident's sleep/wake patterns. This individualized intervention was accomplished by checking and changing incontinent residents at night if they were awake. Residents were left undisturbed for up to five hours if they were observed sleeping. This intervention did not include toileting assistance, but it did significantly reduce nighttime awakenings due to incontinence care without adversely affecting skin health.[32]

14.3.4 Incontinence Care: Labor Estimates

There is extensive data about the time required per episode of incontinence care and the number of residents who are likely to need incontinence-related assistance. According to the most recent Online Survey Certification Reporting System (OSCAR), 1997 data, 49% of NH residents are incontinent, 8% have a catheter, and 14% are on a bladder training program and, thus, presumably need toileting assistance.[33] In fact, 75% of NH residents are reportedly either dependent or require assistance with toileting according to OSCAR. These percentages approximate those reported for specific NHs that have participated in incontinence management research trials. These trials, which have generally excluded people who are catheterized or unable to respond to verbal stimuli, report that 60% of NH

residents are incontinent, with approximately 33% to 50% of these residents responsive to daytime toileting assistance interventions.[11,12]

According to one report, the nursing time required to reposition a resident is 3.5 minutes.[34] Repositioning is recommended every two hours when the resident is in bed and more frequently when the resident is in a chair. However, because most residents who require repositioning also have mobility and incontinence problems, it seems most efficient to either change or toilet these residents at the time of repositioning. Studies show that incontinent residents are wet and need changing approximately eight times in a 24-hour period, with incontinence episodes roughly distributed equally over the 24-hour period.[35] Calculations show that the time per episode of changing is approximately 5.5 minutes, with repositioning occurring during the changing process.[13] Based on this data, a resident who is not a candidate for a toileting program would require four changes with associated repositioning between 7:00 a.m. and 7:00 p.m., at a time cost of 5.5 minutes per episode. Also during this period, these residents would need to be repositioned two more times when they are dry, at a time cost of approximately 3.5 minutes per episode. With this schedule, these residents would receive care every two hours during daytime periods. From 7:00 p.m. to 7:00 a.m., these residents would need another four changes and repositioning. The nighttime schedule would consider a resident's need for sleep, so incontinence care and repositioning would be provided less frequently than every two hours.[32]

With regard to providing toileting assistance to the 33% to 50% of incontinent residents who are likely to be responsive to such care, evidence shows that toileting assistance consumes approximately 7.5 minutes of staff time per episode.[13] How frequently residents need toileting is more controversial, but it has been shown that when residents are offered assistance every two hours and toileted only when they respond affirmatively, they toilet approximately four times in a 12-hour period.[28] Given that toileting programs have not proven successful at night, investigators are not projecting time to implement a nighttime toileting program, even for those residents who toilet during the day. The investigators project that approximately 40% of incontinent residents who are responsive to daytime toileting programs would request three toileting assists between 7:00 a.m. and 7:00 p.m. at a time cost of 7.5 minutes per episode. They will also need an additional three repositionings during this period, at a time cost of 3.5 minutes per episode. During nighttime hours (7:00 p.m. to 7:00 a.m.), investigators project that incontinence care time costs for these residents will be the same as for residents who are not responsive to toileting programs. All nighttime time costs are based on the premise that four repositionings and changes occur in consideration of a resident's sleep.[32]

Data from observational studies have described how incontinence care is conducted under usual NH conditions, with relevance to the time costs associated with implementing incontinence care protocols. These studies show that residents are toileted and changed less frequently than residents prefer or clinical evidence indicates is effective. Studies conducted between 1988 and 1998 in six homes in two states show that changing occurs at a rate of .57 to 1.13 times per incontinent resident over an eight-hour daytime period and toileting occurs at a rate of .23 to .49 times per incontinent resident over the

same period.[13,20] During the night, observational data indicate that toileting assistance seldom occurs (perhaps appropriately, given data that show most residents will not toilet at night) but changing occurs one to three times per resident, often while the residents are asleep.[29,30] These data suggest that nurse aides either do not have adequate time to provide incontinence care or work in a fashion that precludes higher levels of care or both. Indeed, in two studies, the researchers suggested that nursing staff report that inadequate time is their primary barrier to implementing incontinence care protocols consistently.[36,37]

14.3.5 Feeding Assistance

Experts agree that feeding assistance interventions are an important component of NH care. One practice guideline on nutritional care as well as the MDS-based Resident Assessment Protocols (RAPs) which are used in all NHs, recommend a trial of feeding assistance for residents who eat less than 75% of most meals.[38,39] The ACOVE expert consensus panel also rated feeding assistance as an important indicator of nutritional care quality. The panel's approved indicator reads as follows: "If a resident requires assistance for feeding (i.e., MDS eating dependency item scores of 1, supervision, 2, limited assistance, 3, extensive assistance, or 4, total dependence), then NH staff should promote increased independence and self performance with graduated prompting protocols matched to residents' need." The panel agreed that this indicator was valid and clinically important but there was less enthusiasm about how feasible this indicator would be to implement in a typical NH because of staffing limitations. These practice guideline, MDS-RAP, and expert consensus panel recommendations are supported by both indirect and direct evidence.

Many studies support the hypothesis that low staffing levels and a resulting lack of adequate staff to provide feeding assistance results in undernutrition and excessive feeding dependency among residents. These problems occur not only among residents who are completely dependent on staff assistance to eat, but also among many residents who are partially independent.

Investigators reviewed a series of studies that document an association between NH staffing patterns, eating dependency, and undernutrition.[40,41,42] Abassi & Rudman (1993) divided 27 Veterans Administration NHs into two groups: Those with a high rate of undernutrition (as defined by residents' weights and albumin levels) and those with a low rate of undernutrition. A comparison of the two groups showed that in homes with high undernutrition rates, staff were less aware of undernutrition among residents; a higher percentage of residents were eating-dependent; and nursing staff-to-resident ratios were lower.[40] A cross-sectional, observational study involving 200 NH residents in Canada found that undernutrition was positively associated with eating-dependency, poor positioning for eating, slow eating, poor appetite, low activity levels, impaired communication ability, poor mental state, and dysphagia.[42] Kayser-Jones and colleagues (1997) conducted an observational study of 58 residents in

two NHs during all meals for seven days. Findings showed that inadequate staffing and inadequate supervision of nurse aides responsible for providing feeding assistance resulted in multiple problems that contributed to low oral intake and poor quality of life for residents.[41] The problems identified included the following: the majority of residents were fed in bed instead of the dining room; food was served at inappropriate temperatures; feeding assistance was rendered in a sporadic, rapid manner even to residents who ate slowly due to swallowing difficulties; eating assistance was forced upon residents who could eat independently but did so slowly; and some residents received little or no food at all. In this study, the nurse aides themselves reported that they lacked sufficient time to adequately help all eating-dependent residents. Overall, the results of these studies strongly suggest that inadequate NH staffing and supervision during mealtimes adversely affects the nutritional status of residents who require staff assistance to eat and may diminish the quality of the mealtime experience for all NH residents.

A second series of studies documents the amount of time that staff spend providing feeding assistance and/or describes the type of assistance provided. Four of the studies recruited residents who were completely eating-dependent, according to NH staff ratings. Amella (1999) observed 53 resident-nurse aide dyads in one NH for one (breakfast) meal. The average length of time that assistance was provided to these eating-dependent residents was 15.66 minutes ($\pm$ 7.83).[43]

Backstrom and colleagues (1987) instructed NH staff at 24 facilities to take notes at every meal for 28 days for a sample of 214 eating-dependent residents.[44] The staff reported that most (94%) meals in which residents were "spoon-fed" were completed in 20 minutes or less. The median number of staff providing feeding assistance to any one resident during this four-week period was 16 to 20 different nurse aides. The authors report that the variability in the number of staff providing assistance and the small amount of time spent providing physical assistance "could not create situations that promote self-feeding or harmonious assisted-feeding."

Ohwaki and colleagues (1988) studied a group of 111 profoundly mentally retarded, severely physically handicapped individuals with multiple medical problems.[45] It should be noted that this study did not include a NH sample (subjects' ages ranged from 3 months to 11 years); however, all subjects were completely eating-dependent, with severe cognitive and physical impairments. The study showed that professional caregivers spent an average of 57 minutes a day (i.e., 19 minutes/meal) providing feeding assistance. Specifically, caregivers reported that they provided oral feeding assistance for 72 minutes per day (i.e., 24 minutes/meal) and tube feeding for 43 minutes a day. Caregivers also reported, however, that they did not have enough time to provide "optimal" assistance, which they defined as the provision of social interaction during meals.

Findings from other caregiver studies support the perception of NH caregivers that they lack sufficient time to provide optimal assistance. Hu and colleagues (1986) compared the amount of time that NH staff in three facilities spent providing care to a sample of 25 demented residents to the amount of time that family caregivers spent providing the same type of care to 19 demented elderly living in their own

homes.[46] All subjects had to score below 20 on the MMSE to be included in the study. Functional assessments were conducted with all subjects to determine the extent of their physical impairment. Nurses and family caregivers were asked to keep "cost diaries" for two weeks to document the amount of time they spent meeting a variety of daily care needs including, but not limited to, feeding assistance. According to these "cost diaries," NH staff spent an average of 16 minutes per day (i.e., < 6 minutes per meal) providing feeding assistance while family caregivers spent an average of 73 minutes a day (i.e., 24 minutes per meal). For the more severely cognitively impaired subjects (MMSE score $\leq$ 10), NH staff feeding times increased slightly to an average of 18 minutes per day. By contrast, family caregivers increased feeding times for these more severely impaired individuals to an average of 99 minutes per day. Across all daily care areas, family caregivers, compared to NH staff, spent significantly more time providing both supervision and assistance, despite the fact that, according to the functional assessments, the elderly subjects residing at home were more independent in all activities of daily living than the NH sample. The authors explain the difference in feeding assistance times by noting, "One nursing aide can feed and supervise eight to ten residents at the same time," whereas, at home, a family caregiver "must devote his or her entire attention to a single person." Based on the previously reviewed, more recent studies that show a significant association between staffing ratios and undernutrition,[40,41,42] it is unlikely that nurse aides can adequately feed and supervise eight to ten residents. Rather, the time spent by family caregivers (i.e., 24 minutes per meal) [46] is probably more reflective of the time needed to provide "optimal" feeding assistance.

Two other studies have documented the amount of time that NH residents have access to their meal trays and/or receive feeding assistance.[47,48] These studies used subject samples that varied in their eating-dependency status. Steele and colleagues (1997) showed that, in one NH with a resident population representing the full range of feeding assistance needs (i.e., completely independent to completely dependent), the amount of time needed to complete a meal was less than 20 minutes for 13% of the residents, 20 to 29 minutes for 35%, 30 to 39 minutes for 34%, and 40 minutes or more for 18%. The average time to complete a meal for the group was 29 minutes (ranging from 5 to 70). The researchers did not report the total times needed to complete a meal for independent eaters versus residents who required assistance. They also did not present data useful for evaluating the quality or outcomes of the mealtime experience (e.g., how much residents ate and/or whether individual residents received appropriate types of assistance).[47]

Durnbaugh and colleagues (1996) conducted a study in four NHs using a sample of 20 residents who had been diagnosed with probable Alzheimer's disease (AD). The purpose of the study was to test the utility of the Feeding Behaviors Inventory as an instrument to help NH staff identify mealtime behaviors that interfered with a resident's self-feeding ability. The Feeding Behaviors Inventory involved direct observations of two meals per subject. Study results showed that all subjects displayed "problem behaviors" (i.e., behaviors that interfered with intake) during mealtimes, with the most common problem being "distractibility" (i.e., easily distracted from eating). On average, residents had access to their trays and were engaged in eating for 38.8 minutes (ranging from 13 to 54 minutes). Most residents,

however, had to wait in the dining room for more than 20 minutes to receive their trays. The authors reported that the amount and type of assistance rendered to individual residents varied, but they did not report the extent of this variability. They concluded that distractibility was a major problem among AD residents and, thus, suggested that the dining room environment be modified (e.g., to reduce noise levels) and verbal cues be provided to maximize AD residents' self-feeding ability. [48]

A study by Osborn and Marshall (1993) used the Self-Feeding Assessment Tool to determine eating dependency status for a small sample of 23 partially-dependent NH residents with moderate to severe cognitive impairments.[49] The researchers conducted individual assessments of capability (one meal) and performance (one meal) over a total of two meals per subject. The tool included a rating of five levels of assistance: unassisted, verbal prompt, nonverbal prompt, physical guidance, and full assistance. Capability was determined through the implementation of a graduated-assistance protocol that maximized self-feeding ability; performance was assessed through observations of the feeding assistance provided by NH staff. Based on the capability assessment, every subject was capable of self-feeding to some degree; rarely did research staff have to provide full physical assistance. By contrast, the performance assessment showed that NH staff almost always provided full physical assistance. Using research staff assessments of capability as the "gold standard," NH staff "over-assisted" 52% of the subjects and "under-assisted" 30%. The authors reported that the level of assistance needed by individual subjects changed both within and between meals; however, whether or not any assistance was necessary remained fairly stable.

In summary, these studies, which describe what normally happens in NHs at mealtimes, have consistently concluded that both the time spent by NH staff and the manner in which feeding assistance is rendered is sub-optimal and inconsistent for most residents. Furthermore, these studies show that residents take between 16 minutes and 39 minutes, on average, to complete a meal, even under these sub-optimal conditions. The study results delineate components of a feeding assistance protocol that might be more effective (i.e., optimal), but the efficacy of such an intervention has not been evaluated.

With regard to interventions, investigators could identify only three studies that reported the effects of feeding assistance intervention effects.[50,51,52] Phillips & Van Ort (1993) evaluated an intervention to "promote functional feeding and maintain adequate nutritional status" in a small sample of six NH residents who required assistance to eat.[50] Two primary components of the intervention were social interaction and the provision of one-to-one assistance throughout the meal , but the intervention's other components were unclear. Residents were videotaped during eight meals. For four of the meals, NH staff provided feeding assistance under usual care conditions. During the other four meals, the functional feeding intervention was implemented. It is unclear whether indigenous NH staff were taught to implement the intervention or whether research staff implemented it. One videotape from among the baseline tapes, and one from among the intervention tapes were randomly selected and transcribed according to the Feeding Traceline Technique. The results showed that the intervention did not significantly increase the average amount of time required to complete a meal (intervention, 23.14

versus baseline, 24.06 minutes); however, there were significantly more "feeding cycles" (i.e., resident takes a complete bite of food or drink of fluid), which suggests that residents consumed more food and fluid as a result of the intervention. The authors, however, did not report estimates of total intake during baseline or the intervention. There was no difference in the total number of self-feeding behaviors or refusals as a result of the intervention; however, with the intervention, there were significantly fewer interruptions during feeding and the length of time between bites of food and drinks of fluids was significantly shorter. These findings indicate that the one-to-one, uninterrupted feeding assistance was successful in keeping these residents focused on the task of eating. Given the Durnbaugh study's (1996) finding that "distractibility" is common among NH residents during mealtimes,[48] an unknown number of residents may need this type of assistance (few interruptions, verbal cues/reminders to eat, social interaction) to ensure adequate intake.

A second, older study also evaluated a graduated assistance protocol on the independent feeding behavior of two NH subjects using a reversal design. This study reported significant increases in residents' independent feeding behaviors under the behavioral prompting conditions, but did not assess changes in food intake nor report the time needed to implement the intervention protocol.[51]

A third study evaluated the effects of three different feeding assistance programs on a sample of 40 residents in one facility who were identified by an interdisciplinary team as having feeding or swallowing problems that placed them at risk for undernutrition and/or dehydration. The three interventions were: (1) the availability of trained volunteers during one meal per day (i.e., lunch or dinner) to transport residents to and from the dining room and provide feeding assistance; (2) a daily afternoon "Happy Hour" during which residents were transported to a central area and fluids and snacks were provided to residents in a social context; and (3) a separate, "second seating" in the dining room during lunchtime, designed specifically to meet the needs of residents who required feeding assistance and/or experienced swallowing difficulties.[52] The authors report that, prior to implementing the intervention programs, residents with feeding and/or swallowing difficulties were fed in their rooms and, as a result, were "often poorly positioned for eating, left in bed for many hours of the day, and rushed in the eating process" due to staffing limitations. The 40 subjects were divided into four groups. Group One (5 residents) received feeding assistance from NH staff for all meals and snacks in their rooms. Group Two (9 residents) received feeding assistance from NH staff for all meals in their rooms, but also attended "Happy Hour" every afternoon. Groups Three and Four (13 residents per group) both received feeding assistance from NH staff during breakfast and dinner in their rooms but were transported to the dining room for lunch (Volunteer and Second Seating programs) and attended Happy Hour every day. The only difference between groups three and four was that NH staff began monitoring weights during the first month of program implementation for Group Three and after one month of implementation for Group Four.

The primary outcome measure reported in this study was change in weight status over three months. Group One showed an average weight loss (-1.4 lbs) while Groups Two, Three, and Four all showed

weight gains (average + 2.6, 4.2, and 6.2 lbs, respectively). Although the sample sizes within each group were small, these results indicate that providing adequate feeding assistance in a social environment may improve the nutritional status of NH residents with feeding and/or swallowing difficulties.

In light of the absence of intervention studies in this area, the Borun Center is currently collecting preliminary data necessary to design a controlled clinical trial of a feeding assistance intervention. These data provide specific information about the efficacy and time costs of feeding assistance protocols, which is generally absent from the published literature; thus, the data are highly relevant to this chapter.

This preliminary study used a sample of 19 residents in one NH who were considered to be "at risk" for undernutrition due to low food intake. Low food intake was defined as eating less than 75% of five or more of nine meals on three days within one week (i.e., MDS criteria for identifying low intake), and research staff evaluated intake for each of the 19 subjects. The intervention, pilot-tested during two meals for each subject, used the following methodology: (a) Research staff asked residents where they would prefer to eat (i.e., in their own room versus the dining room) and, whenever possible, complied with residents' requests; (b) research staff insured that residents were positioned properly for eating; (c)research staff interacted socially with residents throughout the meal, and (d)research staff provided continuous one-on-one assistance that maximized self-feeding ability (i.e., encouragement, verbal prompts, physical guidance, physical manipulation of items on meal tray so that items were easily accessible to resident). With respect to location of meals, research staff were able to comply with the preferences of the majority (13) of subjects. Such compliance may have contributed to improved intake for these subjects. Specifically, eight residents preferred to eat in the dining room, five residents preferred their rooms, two residents "didn't care," one was unable to state a preference, and the remaining three preferred a location with which staff could not comply (i.e., own home, restaurant). Common problems observed during mealtimes included complaints about food (11 residents), slow eating pace (10 residents), swallowing difficulties (5 residents), and, consistent with findings from one previously reviewed study (Durnbaugh et. al., 1996), distractibility (6 residents). Residents also had unlimited access to their meal trays. A different research staff member conducted continuous, direct observations throughout the meal for all subjects and all meals in order to document the extent of research staff assistance (i.e., type and frequency) and the amount of time required to provide assistance. In addition, photographs of meal trays were taken before and after each meal to document intake. Prior to implementing the intervention, research staff conducted continuous direct observations of NH staff during two meals for each subject in order to document the extent of NH staff assistance (i.e., type, frequency, and time). The 19 subjects represented a full range of eating assistance needs (i.e., completely independent to completely dependent). Table 14.1 presents some of the primary outcomes this study monitored. On average, the subjects were responsive to the research staff's intervention as measured by a significant increase in total percentage of food and fluid intake ($t = 2.38$, $p < .05$).

Table 14.1 Effects of a Behavioral and Environmental Intervention to Improve Intake		
	NH Staff (Mean ± Sd)	**Research Staff-Intervention** (Mean ± Sd)
Intake - Total % (food + fluid)	39% (± 11%)	52% (± 24%)
Verbal Prompts - Total Number/Meal	0.8 (± 1.6)	16.3 (± 11.7)
Time Providing Assistance (minutes)	5.0 (± 7.2)	40.1 (± 14.2
Tray Access Time (minutes)	35.4 (± 15.7)	40.1 (± 14.2)

An analysis of individual data, however, showed that 12 (63%) of the 19 subjects significantly increased their intake as a result of the intervention, while the remaining seven subjects showed only small increases (i.e., < 10% gain) in intake. Five of these seven subjects reported general complaints related to the food itself (e.g., taste, appearance) while the remaining two expressed significant symptoms of depression in a structured interview and reported not being "hungry enough" to eat.

Research staff assistance was compared to NH staff assistance with respect to the total time spent providing any type of assistance (i.e., physical and/or verbal) and the number of verbal prompts provided to residents throughout the meal to encourage self feeding. Findings showed that research staff spent significantly more time providing assistance ($t = 11.14$, $p < .001$) and offered significantly more verbal prompts (range 1 to 50 per meal, mode=23; $t = 5.54$, $p < .001$) than NH staff (range 0 to 6 per meal, mode=0). Interestingly, tray access time did not differ significantly as a result of the intervention. These observational data describing what NH staff normally do during mealtimes are consistent with those reported in other studies previously reviewed in this chapter.

Despite the absence of larger, published trials describing the efficacy of feeding assistance interventions, there is strong expert consensus about the importance of providing NH residents with consistent assistance that maximizes their feeding ability. One expert consensus panel recently recommended that staffing levels, particularly the number of nurse assistants, be increased during mealtimes. Specifically, the panel recommended lowering the current ratio of seven to nine residents per Certified Nursing Assistant (CNA) during the day and 12 to 15 residents per CNA during the evening to three or four residents per CNA during both shifts, at least during mealtimes and for those residents who are eating dependent. The panel also recommended that a registered nurse be available during both shifts to provide adequate supervision, appropriate assessment of resident feeding needs, and assistance to

those residents who are more difficult or time consuming to feed. Panel members agreed that 30 to 60 minutes of nursing staff time per resident is necessary to provide "optimal" feeding assistance.[50]

14.3.6 Feeding Assistance: Labor Estimates

Investigators have reviewed strong evidence that residents receive inadequate feeding assistance under usual NH care conditions. In addition, case studies, expert consensus, and preliminary intervention data suggest that appropriate, consistent feeding assistance can improve food intake, at least under conditions in which such assistance is rendered with one-on-one supervision at a time cost of approximately 25 to 60 minutes per resident. The remaining key issue in determining the labor requirements of a feeding assistance intervention is how many residents are likely to require such assistance.

Estimates of the percentage of NH residents who require some level of feeding assistance range from approximately 30% to 50%, or higher. The estimates vary due to differences in definitions of "assistance" (e.g., total versus partial) and the type of assessment used to determine eating dependency (e.g., NH staff ratings, direct observations of residents during meals, response to graduated feeding assistance protocols that maximize self-feeding capability). A review of these studies follows.

All community NHs and some VA facilities use standardized assessment tools to rate residents' level of dependency in various activities of daily living (ADLs), including eating ability. A cross-sectional study of MDS data for 6832 residents from 202 NHs in seven states showed that 27.9% were "dependent" on staff for eating. Residents' level of dependency (e.g., partial or full) was not specifically reported in this study.[54] The national OSCAR data, which is also based on NH staff ratings of dependency status, indicates that 48% of the NH population requires some level of assistance (i.e., supervision to full assistance).[33]

Another study, conducted in a VA facility, examined the nutritional status of 130 residents using the Nursing Patient Classification. The subject sample represented 92% of the total resident population. In this study, 6% of the subjects were rated as "completely independent" in all ADLs, including eating; 45% were rated as requiring "partial assistance" in one or more ADLs; and 50% were rated as "completely dependent" in all ADLs.[55] Thus, a minimum of 50% of the residents required full feeding assistance. This estimate is conservative because an unknown number of additional residents required "partial assistance" with eating.

Instead of examining MDS data, Siebens and colleagues (1986) asked all NH staff (i.e., licensed nurses and nursing assistants) in one facility to complete a questionnaire about the diets, upper extremity dysfunction, signs of dysphagia, and self-feeding ability of 240 residents. A physician and speech-language pathologist conducted chart reviews and independent examinations of a sub-sample of 131 residents. It is unclear, however, whether these independent examinations included an evaluation of

self-feeding ability. The NH staff reported that 47% of the subjects were "dependent". Of these subjects, according to NH staff, 33% required only "verbal supervision" while 67% required physical assistance. Residents who required physical assistance represented 32% of the total NH population. Staff also reported that the need for physical assistance was variable for this group, with approximately 50% requiring physical assistance "all of the time" (i.e., every meal) and 50% requiring physical assistance "part of the time" (i.e.,. some meals and not others).[56]

Other studies have determined the prevalence of eating-dependency through direct observations of mealtimes and documentation of the level of staff assistance provided to individual residents. Implied in these studies is that staff have accurately assessed each resident's need for feeding assistance and are, thus, providing the appropriate level of assistance. This assumption may be flawed, because it is unclear what assessments NH staff conduct to determine a resident's need for feeding assistance. For example, Steele and colleagues (1997) conducted an observational study in which a Mealtime Screening Tool was administered to 349 residents in one facility. The tool was used to assess "current feeding assistance patterns" as provided by the indigenous NH staff, based on an observation of each subject for one complete meal. The primary purpose of the tool was to identify eating-related difficulties that interfered with oral intake. Based on the observations, research staff rated 51% of the subjects as "independent" and 49% as "dependent" or requiring (e.g., receiving) some level of staff assistance. The types of feeding assistance provided by NH staff ranged from tray setup (14%), monitoring (5%), verbal prompting (3%), partial physical feeding (8%), to total physical feeding (18%).[47] An important limitation of this study is that observations were conducted for only one meal per subject; thus, variability in feeding assistance was not measured. Other studies have shown that there is variability in the amount and type of feeding assistance NH staff provide to residents as well as residents' need for assistance.[48,49,56]

Another study, conducted in a long-term-care hospital for veterans in Canada, involved observations of 200 residents during all three meals on one day. Based on these observations, 25% of the subjects were rated as "completely dependent" on staff for eating and 15.5% were rated as "partially dependent" (i.e., observed to receive some assistance). Thus, a total of 40.5% of the subjects required some level of feeding assistance. This study also showed undernutrition was significantly associated with needing more than 25 minutes to complete a meal.[42]

Finally, one could estimate the number of residents who might need feeding assistance by estimating the number who consistently eat less than 75% of most meals. The 75% criterion serves as a trigger on the MDS for identifying residents who are at risk for potential nutritional problems. In three recent studies, research staff conducted independent assessments of food intake and compared these estimates to NH staff documentation of intake.[57,58,59] Results from two of these studies indicate that approximately 65% (Simmons & Reuben, 2000) to 75% (Pokrywka et. al., 1997) of NH residents eat less than 75% of most meals and, thus, are at risk for potential nutritional problems. All three studies found that NH staff significantly overestimated residents' intake levels by approximately 20% or more, compared to

research staff estimates. As a result, NH staff may fail to identify many residents potentially at risk for undernutrition due to low food intake.

14.4 Activities of Daily Living (ADL) Independence Enhancement (Morning Care)

The studies investigators have reviewed that focus on multiple ADL care areas generally drew two conclusions: (1) Nursing staff provide excessive physical assistance to residents for most activities of daily living; and (2) Behavioral interventions relying on graduated assistance protocols quickly increase residents' independence. The fact that it takes less time to physically help residents complete an ADL task than it takes to motivate them to do the task by themselves is frequently cited as a primary factor that reinforces care patterns which create "excessive disability."

Two recent studies focusing on the ADL area of dressing provide specific data about behavioral intervention processes that promote independence as well as data about associated time costs. In addition, one of these studies provides information about the time required to complete all ADL morning care, including dressing, bathing, grooming, toileting, and oral mouth care.

In the first study, by Beck, et al., 1997, a behavioral intervention based on a graduated assistance protocol targeted a group of NH residents with cognitive impairment but no psychiatric diagnoses.[9] These residents had no physical disability that prevented them from dressing themselves. The types of physical disability that would have led to a subject's exclusion were not defined. Most of the 90 residents who participated in this study quickly improved in dressing independence, as measured by direct observations. The time required to implement the intervention was 5.10 minutes, with a standard deviation of .24 minutes (range 2.03 minutes to 12.58 minutes).

In the second study, Rogers, et. al., 1999, used a similar behavioral intervention and also targeted a group of demented NH residents. In this study, however, residents were not excluded for either psychiatric diagnoses or physical disabilities that prevented independent dressing. Presumably, this study targeted a more behaviorally disturbed and physically impaired NH population than the Beck study. This study also reported the total amount of time needed to complete all ADL morning care tasks, including dressing, bathing, toileting, oral hygiene, and grooming, during both usual care and the intervention period. The intervention targeted only dressing ability, and immediate improvements in dressing independence were produced. The total time for all ADL care activities was 10.5 minutes under usual care conditions and 20.09 minutes during the intervention period. Dressing care consumed an average of 4.10 minutes during usual care and 11.18 minutes during the intervention.[60]

Two other controlled studies have reported positive effects of behavioral interventions for multiple ADL skills.[10,61] The first study tested a behavioral intervention designed to promote independence in toileting, eating, dressing, grooming, standing, and walking. In this intervention, clinical specialists in geriatric nursing and one rehabilitation aide provided ADL practice to subjects in a group setting (up to eight

residents). The sessions were conducted for 2.5 hours a day, five days a week, for 20 weeks. The intervention group showed significantly more improvement in independence than the control group. The authors speculate that a less intensive maintenance protocol might be effective in maintaining the gains produced by the intervention, although they reported no data pertaining to maintenance issues.

Maintenance of ADL gains is a key problem according to two other reports. In one study, Blair, 1995, implemented a care process based on operant conditioning and reported immediate improvements in multiple ADL areas, including shaving, bathing, dressing, combing hair, feeding, and brushing teeth. [10] Unfortunately, the study did not report the amount of time needed to implement any of the care processes nor did it report how the intervention separately effected each of the ADL activities. The authors noted, however, that nursing staff reverted to their usual care practices, which promote dependency because of time pressures. Two other authors have presented reports from caregivers that they lack sufficient time to implement care practices that promote more independence. [36,37]

An additional study has provided data about the amount of time required to provide morning care, although it did not describe interventions targeted specifically toward ADL independence. In this study, the intervention was designed to promote better communication between caregivers and residents. Positive results were reported on multiple measures of communication with more mixed results on ADL independence measures. [62] The study reported that the total time needed to provide morning care during the intervention period was 13.7 minutes, not including time for incontinence care. This estimate is comparable to the 20 minutes for ADL care reported in the study by Rogers, et. al., 1999, which included time for incontinence care. As noted in other studies reviewed in this chapter, incontinence care consumes about five to seven minutes per episode.

14.4.1 ADL Morning Care: Labor Estimates

As previously noted, studies show that protocols that increase residents' independence in morning ADL dressing consume approximately 7 to 11 minutes per care episode. In addition, total morning care for *all* ADLs ranges from 14 to 20 minutes.

Several studies suggest that independence in morning ADL areas other than dressing can be improved with behavioral interventions based on graduated assistance protocols. These studies, however, have not provided specific data about the amount of time needed to implement these protocols, nor have they reported improvements in specific ADL areas. For these reasons, investigators chose to include only behavioral care processes that promote dressing independence in the analyses to be conducted in this chapter because of specific data describing both a process-outcome link and time costs. However, investigators will use the data provided by other studies to estimate the total time required to complete all ADL morning care. These data will be used to estimate how much time nursing staff have available to implement the behavioral care processes that promote independent dressing. It should be noted that the time needed to provide this "other ADL" care under usual care conditions does not include time to

implement protocols designed to increase independence. Implementing graduated assistance protocols for these "other" areas would almost certainly increase ADL time above that spent in usual care conditions. Finally, investigators will assume that residents will require the same time from nurse aides for p.m. care (e.g., going to bed) as they do for a.m. care. Investigators could locate no studies that specifically reported p.m. care times, but the ADL tasks appear to be identical during the a.m. and p.m. time periods (e.g., clothes changing, oral care, etc.).

The remaining key labor requirement issue concerns how many residents would need behavioral protocols that promote ADL independence. Unfortunately, the clinical trials that have been conducted—and reviewed in this chapter—used different subject inclusion criteria. With their descriptive data, it is not possible to estimate the number of NH residents who would likely need ADL dressing protocols. Two alternative sources, however, provide information about the number of residents who are either semi- or totally dependent in multiple ADL skills and/or dressing. The most recent OSCAR data indicates that approximately 85% of NH residents are either dependent in or require assistance with dressing.[33] A second study using a large MDS database reported that 14% of residents in the sample were independent in seven ADL areas: bed mobility, eating, toileting, transferring, locomotion, dressing, and grooming. This study did not report specific ADL dressing data, but assuming that dressing is an early ADL loss, investigators can project that most residents who are dependent in some ADL area (86%) have problems with dressing.[63] This study also reported data about the total amount of nursing time needed to provide assistance to residents with different ADL limitations under usual care conditions. Unfortunately, time amounts were not reported for different types of nursing staff (licensed vs. nurse aides) nor was specific information given about the amount of time needed to provide care for any one ADL area (e.g., dressing).

14.5 Exercise

Investigators could find no practice guidelines for NH residents written explicitly on the topic of exercise, even though multiple quality indicators prescribe exercise for both treatment and prevention purposes. Quality indicators recommending exercise were approved in the ACOVE project for such diverse conditions as osteoporosis, falls, prevention of disability, and residential life quality. For example, the approved quality indicator pertaining to residential life quality reads as follows: "If residents are physically inactive, then they should be provided with assisted exercise daily unless they refuse."

Investigators reviewed a number of both controlled and uncontrolled intervention studies that generally reported beneficial outcomes of exercise for NH residents. Investigators elaborate here on primarily the controlled studies.

In their largest controlled study, Fiatarone and her colleagues evaluated a progressive resistance-training program with ambulatory and mildly cognitively impaired residents in a long-term-care facility

that included both NH and assisted living residents. The progressive resistance training was implemented three times per week for 45 minutes per day with one-on-one supervision of participating residents. The researchers reported significant improvements in resident leg muscle strength, stair-climbing power, and physical activity, at least during the training days. There was also a trend for significant increase in muscle mass.[64]

Two controlled studies have evaluated the effects of a walking endurance intervention for ambulatory NH residents.[65,66] One study recruited residents similar to those recruited for the Fiatarone study with respect to ambulatory status, but these subjects were more cognitively impaired, and all of them lived in NHs. In this study, supervised walking exercise was offered once a day for 30 minutes for 12 to 22 weeks. Significant changes were reported on two walking endurance measures. The second study also evaluated a walking exercise intervention implemented three days a week for 30 minutes per day for 10 weeks. This study recruited ambulatory but severely cognitively impaired residents who suffer from Alzheimer's Disease and reported significant improvements on a communication score measure.[66]

One controlled study recruited incontinent NH residents who were significantly less ambulatory than the subjects who participated in all the preceding controlled trials but who were as cognitively impaired as the residents who suffer from Alzheimer's Disease in the previous study.[67] In this trial, 60% of the residents used wheelchairs for mobility and 40% could walk safely only with some human assistance. Sit-to-stand exercise and walking or wheelchair endurance was integrated with an incontinence care protocol that was offered every two hours between 8:00 a.m. and 4:00 p.m. The residents were offered the opportunity to exercise four times per day. Residents complied with the exercise three times per day, and the exercise added approximately six minutes per incontinence care session. The total time for incontinence care plus exercise was about 13.2 minutes per session, with a range from 2 to 17 minutes. Significant improvements in walking, wheelchair, and standing endurance were reported for the exercise group while direct observational measures of agitation showed significant improvements in both the exercise group and the group randomized to incontinence care only, which received extensive social interaction.

More recently, a controlled study reported the effects of an exercise program implemented by NH staff and volunteers on three performance measures (sit-to-stand, balance, walking endurance) as well as ADL decline as measured by the MDS.[7] There were no significant differences between the intervention and control groups on the three performance measures, but the exercise intervention group showed significantly less decline on ADL scores than the control group. The study did not report how many residents participated in the exercise sessions or how much time was devoted to the sessions. Endurance training was offered every other day (on alternate days, resistance training sessions were offered), and nursing staff "monitored" residents' walking for up to 20 minutes during these sessions. The study noted that an unknown number of residents who were assigned to the exercise group did not exercise because of either cognitive or physical impairments. The specific ADL performance of these subjects was not separated from the performance of those subjects who participated in the exercise

sessions. No information was provided about the differential ADL performance of these two groups. Despite the absence of more specific data about the exercise program, the associated time costs, and the number of staff or residents involved in the program, this study does have important implications for this chapter. The study implies that an unknown number of volunteers can supplement NH staff to successfully implement an exercise program.

Three other controlled studies evaluating exercise interventions reported mixed results. One study randomized a small group of 15 residents without significant cognitive impairment to an exercise program based on cycling activity and upper body exercise.[68] The program was implemented three times a week for an unknown period of time, although it was clear that the residents could not tolerate more than five to ten minutes of activity during any one session. Due to this level of deconditioning, a rest session was scheduled between the exercise sessions. This study reported significant increases in upper body strength but no improvements in lower body strength. The researchers attribute these mixed results to a high illness rate among the subjects.

A second study randomized 97 restrained NH residents to an exercise intervention that involved rowing, walking, or wheelchair endurance training for approximately 20 minutes a day, and behavioral training based on the principal of over-correction for safety issues (e.g., locking wheelchair before sitting down).[69] The sessions were conducted three times per week. Compared to the control group, the exercise group showed significantly more improvement in wheelchair mobility endurance and upper body strength measures, but not in walking endurance or measures of lower body strength. In addition, the objective performance measures of fall risk showed statistically significant but not clinically significant differences between groups. This study reported that many residents did not complete the exercise program because of either illness or failure to comply with the exercise protocol due to behavioral disturbance issues.

The third controlled study evaluated an intervention implemented by physical therapists three days a week for approximately 30 to 45 minutes a day for four months.[70] This study reported no differences between intervention and control groups on most of the physical performance measures and observational measures of a resident's ability to perform ADLs, although there was improvement on one mobility endurance measure. This study implied that the high frailty and illness rate that characterizes the NH population limited the effectiveness of the intervention. Indeed, all three of the controlled exercise studies that reported negative or mixed results cited residents' frailty and inability to consistently participate in exercise interventions.

In addition to the clinical data, there is evidence that residents value exercise interventions. One study reported that residents valued a program that provided at least 15 minutes of supervised activity or exercise per day over such options as private rooms or better food.[28] These preference data reinforce those reported in a nationwide study that used quantitative procedures to prioritize services valued by NH consumers.[21] In this study, access to physical therapy programs was the most valued service. A

third study reported that NH residents who require ambulation assistance from staff reported a preference for receiving walking assistance twice a day and also expressed dissatisfaction with the number of assists per day that are actually provided in NHs.[19]

14.5.1 Exercise: Labor Estimates

Investigators reviewed controlled studies indicating that either progressive resistance training or endurance training has beneficial effects on residents who can ambulate without physical assistance if implemented from three to five times per week for 30 to 45 minutes per session. Another controlled study targeting less ambulatory and more physically frail incontinent subjects also reported positive effects from an exercise intervention that consumed approximately 18 minutes per day beyond the time needed to provide incontinence care. Two other controlled studies reported both positive and negative effects of exercise on ADL function, but either provided no data about time costs (e.g., Morris, et. al., 1999) or described interventions that were not under the control of nurse aides (e.g., Mulrow, et. al., 1994).

The clinical outcome's data do not make an overwhelmingly strong case that exercise interventions will produce important changes in resident functioning, but they generally indicate that residents who are healthy enough to consistently participate in exercise enjoy some positive outcomes. When this clinical data is considered along with residents' preferences, a strong case can be made that exercise care processes are valued, potentially beneficial, and should be a daily care practice offered to residents.

Furthermore, because exercise is conceptualized as a prevention intervention, all NH residents, with the exception of those few who are bed-bound or who prefer not to exercise, would be candidates for exercise. With bed-bound residents, investigators assume that some range of motion exercise (either passive or active) is necessary to prevent contractures, although the Mulrow, 1994, study suggested that such exercise was ineffective. Unfortunately, it is unknown how many residents would rather not exercise or cannot exercise because they are sick at the given time period. Thus, for the purposes of this chapter, investigators will assume that all NH residents are candidates for exercise, at least on days when they are well.

The subject recruitment criteria described in the clinical trials provide further assistance in identifying the time cost of the exercise care processes. Investigators can also assume that the NH residents can be roughly subdivided into three major groups with respect to the type of exercise most appropriate for them. Residents who are incontinent, or those who receive toileting assistance, are generally more cognitively and physically impaired than continent residents and comprise 70% of the NH population. These residents are candidates for the previously reviewed intervention that was integrated with incontinence care and which consumed about 18 minutes per day beyond incontinence care.[67] If this intervention were not integrated with incontinence care, the time cost would be higher due to the extra

time needed to locate residents for the singular purpose of exercise. Less cognitively impaired and ambulatory residents, most of whom are very likely not incontinent, are good candidates for either the progressive resistance training or walking endurance programs, which are implemented 30 to 45 minutes per session, three to five times per week.[64,65,66] Although the continence status of the residents who participated in these exercise trials was not reported, investigators do know that the participants were significantly more cognitively intact and more ambulatory than the incontinent residents who participated in the exercise trials. The assumption that these ambulatory residents generally were not incontinent and did not need toileting assistance is justified based on these data and the fact that immobility and dementia are the two primary risk factors for incontinence in NHs.

If 70% of residents in a NH are incontinent and approximately 8% are bed-bound, as reported on 1997 OSCAR, investigators project that the remaining 22% are candidates for the walking endurance or progressive resistance training interventions. With respect to bed-bound residents, there are no studies to the investigators' knowledge that have documented a relationship between a specific range of motion exercise and an outcome measure. However, given that range of motion exercise is required as "standard care" for bed-bound residents, investigators will assume that this group requires two to three minutes of such exercise four times a day, to be integrated with other care (e.g., incontinence care).

Investigators found three studies that report the frequency of exercise or activity provided to residents under normal NH conditions. In one study, restrained residents who were capable of independent ambulation were observed in assisted walking movement on less than 1% (.6) of 48 observations conducted over two days.[71] In the same study, residents who were ambulatory and unrestrained were observed in movement on 16% of the observations, although 22% of these residents were never found walking on any of the observations. Measures of fall risk were significantly predictive of low activity levels for both restrained and unrestrained residents, suggesting that residents' fear of falling limits their willingness to move, even when they are unrestrained and they can do so independently.

A second study of 230 residents in eight NHs described the location of residents between 6:00 a.m. and 7:00 p.m. These location data suggest a high degree of physical inactivity. The residents were observed in bed on an average of 36% of the observations, with the majority of residents in bed before 10:00 a.m. and after 4:00 p.m.[72]

In a third study, residents who were capable of independent ambulation but who required assistance were observed every 15 minutes for one minute between 7:00 a.m. and 5:00 p.m. for three consecutive days. The study reported that residents received an average of .23 walking assists per day (mode 0 to 2), although their stated preference was for an average of two assists per day. [20]

These three studies suggest that NH residents, even those capable of independent ambulation, are extremely inactive under usual care conditions, receive less supervised walking assistance than they prefer, and spend more than 36% of the daytime period in bed.

14.6 Input Variables for Staffing Model

14.6.1 Input Variable I: Estimating Amount of Nurse Aide Time Available to Provide Direct Care

Investigators considered two approaches to estimating this input variable. For the first, investigators reviewed studies that estimate the amount of time residents receive care from nurse aides and considered using these calculations as potential estimates of the "time available" to provide care. This approach works if one assumes that the amount of time residents reportedly received care in these studies reflects what nurse aides are capable of providing under normal work conditions and if the studies provide consistent data. Both points proved problematic.

One study (by Holmes, et. al., In Press)[73] using a computerized time recording procedure, reported that the total time a resident received either direct or indirect care from a nurse aide in a 24-hour period was 44.8 minutes. This study was conducted in both special care and traditional care units in NHs and documentation activities were considered to be indirect care activities. This study divided the total time by shift and reported that, on average, a resident would receive care from nurse aides for 19.1 minutes on the 7:00 a.m. to 3:00 p.m. shift, 15.2 minutes on the 3:00 p.m. to 11:00 p.m. shift, and 10.3 minutes on the 11:00 p.m. to 7:00 a.m. shift.

Using the same computerized time recording procedure as the Holmes study, a second series of studies, which led to the RUGs used by HCFA for prospective payment, reported that the average time a resident received direct/indirect care from nurse aides in a 24-hour period was 139 minutes.[74] These studies did not provide time estimates for each shift. Unlike the Holmes study, these studies included many residents on transitional care units, in addition to chronic care residents. Staffing ratios in transitional care units may be higher than those in traditional NH units, and transitional care is not the focus of this paper.

Ultimately, investigators decided not to base their time estimate on these studies for two reasons. First, the studies report significantly different time estimates. Second, staffing levels in the facilities during data collection were not reported in any of the studies. Given the large discrepancy in the studies' time estimates, the work or staffing conditions in the two groups of NHs must have been very different. For example, if the daily time estimate in the Holmes study (44.8 total minutes over 24 hours) was distributed over 24 hours, then a resident would receive only about two minutes of care per hour. Does this reflect poor management of nurse aides or typical work patterns that actually exist in NHs?

Alternatively, assuming that the RUGs data are more accurate presents another dilemma because these time estimates exceed the average nurse aide minutes reported as available by NHs in OSCAR.[33] According to the OSCAR data, 126 minutes of nurse aide time is scheduled per resident per 24-hour period. By comparison, the RUGs studies reported that 139 minutes of nurse aide time is received per resident in a 24-hour period.

Rather than assume an arbitrary ratio for the number of minutes per hour that aides could deliver direct resident care, investigators chose to use a second approach. Investigators developed a simulation of the process of delivering care and assumed that nurse aides are available to provide care during their scheduled shift time whenever they are not specifically on meal breaks or other scheduled breaks. Thus, full-time aides scheduled for an eight hour shift (480 minutes) are available to deliver care for seven hours (420 minutes, that is 480 minutes minus 60 minutes for breaks/ meals). Investigators then included in the simulation not only the time spent directly delivering care to residents, but also an estimate of how much time it would take aides to locate residents and walk to and from care delivery. This was necessary because the studies that do report time estimates for providing efficacious care processes (e.g., feeding assistance) do not include time estimates for locating and transporting residents so that this care can be delivered. Moving between residents to provide care can be very time consuming, as evidenced by one observational study that found that walking was the most frequent aide activity observed.[75]

To estimate transportation time, investigators first collected data describing how much time it took research staff to locate residents and to provide exercise and incontinence care in an on-going NIH clinical trial project. These observations were conducted on two floors with different configurations that represented two typical NH floor arrangements, according to one report.[76] One was an L-shaped floor with the nursing station centrally located and the other was T-shaped, also with a centrally located nursing station and dining room. Observations of 130 care episodes revealed that it took approximately 3 minutes between the time one care process was terminated with a resident and the time another was initiated with a second resident. Investigators then estimated the total time that an aide would spend locating residents by simulating the movement of aides from one resident room to another during episodes of scheduled care. Investigators assumed that aides traveled at typical rates observed in other health-care settings, that is 114 feet per minute when moving by themselves and at the speed of the residents when accompanying residents. Investigators estimated, based on published reports, that wheelchair-bound residents move at 30 feet per minutes (.16 meters per second) and residents requiring assistance walk at 40 feet per minute (.2 meters per second).[67] These assumptions resulted in simulated average travel times of less than 1.5 minutes per episode of care. Thus, the investigators simulated travel times are conservative underestimates compared to the times observed in the field.

A second assumption affects the percentage of time an aide spends in travel; that is, the degree to which services for a resident are "bundled" on a single trip. In the simulation, services such as toileting assistance, range of motion exercises, repositioning, or housekeeping services were combined when this

was reasonable (based on time of day) and feasible (based on upcoming shift changes or time-limited services such as meals). Investigators assumed a different type of "bundling" when aides needed to accompany residents to and from the dining hall. In this case, rather than have the aide escort one resident at a time (with a separate trip to pick up each resident), investigators assumed that a single aide could make a "sweep" down a corridor escorting up to seven residents on a single trip. These assumptions combined to produce about 5 minutes of travel time per aide per hour worked. This varied by shift, with aides on the 11:00 p.m. to 7:00 a.m. shift spending about 25 minutes per shift in travel, while day and evening shift aides spent about 40 minutes per shift. Given the conservative nature of their assumptions, investigators believe that aides will spend at least this much time in walking to and from care episodes in real NH operations.

Output from the investigators' simulation was used to estimate the fraction of time that aides actually spent in direct resident care, as well as the time they spent in direct care plus travel, based on the assumptions above. The investigators' detailed findings are presented and discussed in the Results section. While varying by shift and staffing level, the estimates averaged more than 40 minutes of direct care in a 60-minute period, a number consistent with field observations.

Two observational studies that focused on describing the work behavior of nurse aides provide information to substantiate the validity of this 40-minute time estimate.[75,77] Unlike the time studies described previously, these observational studies focused on the work behavior of nurse aides rather than the amount of time residents received services.

The two studies differ in their observational strategies and definitions of work activities in several critical ways. One study, for example, collected information about three different staff members, most of whom were nurse aides, every 15 minutes during the 8:00 a.m. to 5:00 p.m. shift.[77] For the second study, the researchers scanned the hallway and recorded the behavior of the first two staff members they could locate, collecting the data at the point of location. With regard to their definitions of direct resident care activities, one study included documentation activities while the other did not.[75]

Despite these differences, the studies reached remarkably similar conclusions regarding the percentage of observations that found nurse aides providing direct care. In one study, 67% of all observations were of direct care activities such as bathing, incontinence care, shaving, feeding, and "procedures." In the second study, it was more difficult to calculate all "direct" care activities, but easy to distinguish the percentage of observations during which nurse aides provided no resident care. In this study, nurse aides were using the phone on 2% of the observations, sitting alone or simply not working on 14.5% of the observations, and talking with other staff on 16.8% of the observations (total = 33%). Both studies, thus, concluded that approximately 67% of all observations were of direct resident care activities.

Neither study recorded the "duration" of observed resident care activities, so investigators cannot translate their "percentage of total observations" directly into a time measure. At the same time,

however, it is likely that a correlation exists between the frequency of observed activities and the amount of time engaged in them.[78]

The authors of both studies note that their data indicate more resident-care behavior than was reported by similar observational studies conducted in acute-care facilities or facilities for the developmentally disabled. Thus, both research teams openly worried about the possibility that their observations were reactive and improved the work behavior of the staff being observed. Despite their limitations, the studies provide specific and consistent advice about how to estimate the amount of time that nurse aides have available to provide direct care.

These studies suggest that an estimate of how much time aides have available to provide care can be derived by correcting the 60 minutes that it is theoretically available to provide care by a 33% correction factor, suggested by both studies as the amount of time that aides spend in non-direct care activities. The resulting figure of 40.2 minutes for direct care (60 minutes minus 33%) is very similar to the figure that investigators derived by their alternative approach of correcting 60 minutes per hour by times for breaks, meals, and travel time. In both cases, the 40 minutes per hour available to provide care most likely reflects NH work conditions in which direct care staff are either very well-managed or working unusually hard.

Finally, there is also the issue of how to evaluate the time required to provide necessary care that did not meet the investigators' inclusion criteria for a process-outcome link. In the absence of defensible data about how much time such other care takes, investigators decided to be conservative in estimating these time requirements. Investigators allowed 15 minutes for a shower or bath on a schedule of approximately twice per week and 10 minutes per day for such housekeeping tasks as making beds, sorting laundry, replacing supplies, etc. In cases where residents needed no assistance with a specific ADL care area because of their independence, investigators assigned a minimum time of one to two minutes for such nurse aide activities as providing these residents with their food trays or checking with them in the morning as they were getting up. Investigators also assigned five minutes at the beginning and end of each shift for shift report and documentation activities. Finally, interviews with nurse aides at sites participating in the investigators' clinical trials indicated that they also spend time in unscheduled care activities. For example, answering requests for assistance, cleaning up spills, or transporting residents to doctors' visits. Investigators decided to account for some of these unscheduled events in some of the work scenarios that they evaluated because of their surprisingly large impact on work scheduling and efficiency. In general, investigators believe that their estimates of time spent on all of these other care-related activities are extremely conservative, as investigators will discuss further in the "Limitations and Future Directions" section of this chapter.

14.6.2. Input Variable 2: Time to Provide Care

There are two components to this input variable: (1) The amount of time that it takes to implement a

care process per episode of care, and (2) the number of episodes of care that are required to produce a beneficial outcome. For example, how long should a resident receive walking exercise on any given exercise session, and how frequently should the sessions be scheduled to produce beneficial effects?

It was problematic to arrive at a specific number for this critical input variable. These problems were created in part by the way research trials and practice guidelines are designed and reported. Most notably, time to provide a care process was not calculated in many studies that otherwise validated a process-outcome link, and practice guidelines do not report labor time associated with their assessment and intervention recommendations. Labor times are also effected by work routines. For example, practice guidelines recommend multiple care routines for pressure sore prevention including repositioning, incontinence care, and mobility exercise.[14] It is obvious that these care routines should be integrated in daily practice for efficiency purposes and should not be viewed as independent processes to be scheduled separately (e.g., changing one hour and repositioning at another). In most cases, however, there is scant data to describe time costs when care routines are integrated or scheduled in consideration of efficiency.

14.6.3 Input Variable 3 : Number of Residents that Need Care

The total amount of time per work period or shift that a nurse aide must spend in providing efficacious care is a product of input variable 2 and the number of residents who need a specific care process. For example, if incontinence care takes 7 minutes per episode and must be delivered 3 times per shift to produce high levels of dryness, then any one resident will require 21 minutes of direct incontinence care in an 8-hour period (Input Variable 2). However, the total time demand on the aides delivering care would be 21 minutes multiplied by the number of residents who need the incontinence care. Thus, if four residents need incontinence care, then the total time required of aides in any one shift is 4 multiplied by 21 minutes or 84 minutes.

Two problems arise with regard to projecting the number of residents who need a specific care process. The clinical studies investigators reviewed vary with regard to their subject exclusion criteria and seldom report the number of residents who were either responsive to or preferred a particular intervention once it was implemented. Ideally, an estimate of the number of people who are candidates for a care process should be based on data concerning the number of people who either want or are likely to be responsive to the care process. For example, investigators know that 33% to 50% of residents who are incontinent are likely to be responsive to a toileting care process.[11,12] Thus, it would be inappropriate to assume that all incontinent residents are good candidates for toileting assistance. Unfortunately, investigators have no information about how many residents either want or would be responsive to the exercise, feeding assistance, or ADL independence enhancement protocols that they are evaluating.

14.6.4 Investigators' Approach to Estimating Input Variables 2 and 3

1. Investigators used responsiveness data when possible; but in the absence of such data investigators used only descriptive data about the number of residents who have a problem (e.g., dressing dependence) as an estimate of the number of residents who are candidates for a care process.

2. In cases where multiple care routines could be integrated and when it might be possible to provide simultaneous care to multiple residents, investigators made reasonable estimates about the time required to implement the integrated care.

3. With regard to work scheduling efficiency, which impacts on how well different care activities can be integrated for implementation, investigators developed a scenario that permitted 100% of care to be delivered with the minimal number of staff.

The efficiency scenario presumes that most residents are out of bed by 8:00 a.m., many nap in bed around 2:00 p.m. but, after waking, do not return to bed for the night until after 7:00 p.m. In this scenario, most residents eat all meals in the dining room, where they receive feeding assistance in groups. All other care processes are scheduled around or integrated with the labor intensive mealtimes.

To implement this scenario, it is necessary for nurse aides to provide the morning ADL care to approximately 20% of the residents who need it between 6:00 a.m. and 7:00 a.m. Investigators consider this schedule feasible given that some residents seem to prefer early rising times. The day shift then completes all ADL care for the remaining residents between 7:00 a.m. and 8:00 a.m. except for the full bed bath, which is delayed until later in the morning so that there is sufficient time for breakfast. Also in this scenario, and again to save time for feeding assistance at breakfast, all residents who require ambulation or wheelchair mobility assistance are actively transported to the dining room by staff between 8:00 a.m. and 9:00 a.m. Investigators considered this type of resident transport necessary in order to save time for feeding assistance at breakfast. Research findings provide the rationale. Studies show, for example, that wheelchair-bound residents independently wheel their chairs at an average of .16 meters per second when given frequent encouragement; the average resident who requires human assistance with walking strolls at approximately .20 meters per second.[67] Investigators estimate that approximately 70% of NH residents move at these speeds. Thus, it would take four to six minutes of staff time per resident to provide mobility assistance between 8:00 a.m. and 9:00 a.m., with a consequent loss of time to provide feeding assistance. Alternatively, staff, who walk much faster than residents, can transport residents to the dining room in significantly less time. Based on data describing residents' ambulation ability, investigators project that approximately 22% of NH residents can move to the dining room without staff supervision and approximately 8% of residents will be bed-bound or otherwise sick and unable to go to the dining room on a particular day. Data to support the investigators' projection that 70% of residents can move to the dining room with supervised assistance is provided in the literature review on exercise.

Despite the lack of early morning exercise under this scenario, most residents will be in the dining room for breakfast, so investigators can assume that the feeding assistance protocols, which have proven effective on a one-on-one basis, can be implemented with groups of residents. In this regard, investigators assume that residents who are completely dependent on staff for food assistance could be fed in groups of two and that residents who needed only prompting or minimal assistance could be fed in groups of four. The literature review on feeding assistance only provides data about the time needed to provide feeding assistance to residents on a one-to-one basis, but there is some indication that residents could be provided such assistance in a group social context.[52] Investigators divided the time reported spent in providing assistance in a one-to-one situation by the number of people in the group. In addition, since all residents, except those few who are bed-bound, will be in the dining room, the exercise and incontinence management protocols can then be integrated and delivered between 10:00 a.m. and 5:00 p.m., with residents receiving exercise on the way to their rooms for incontinence care or naps; en route to shower rooms for baths; or on their return to the dining room for lunch or dinner. Residents who are not incontinent, bed-bound, or catheterized (approximately 30% of a typical aide's work load) and who are more ambulatory can also participate in group exercise sessions four times per week, 30 minutes per day, starting from the dining room area.

Investigators also conceptualized other scenarios that involve more flexible mealtimes and operate on different assumptions about the number of residents want to eat in the dining room, want to exercise, or want any of the other care processes investigators selected for evaluation. These scenarios place a greater and much-needed emphasis on individualized care, based on a resident's preferences. Space and time constraints prevent us from either describing or analyzing the outcomes of these individualized care scenarios. However, investigators believe such analyses should be conducted given that individualized care has been recognized as an important element of quality; is not being considered in the work scenarios investigators are analyzing; and yet has such important staffing implications. Most notably, more staff members than those projected in the investigators' efficiency focused scenarios would be necessary to individualize care due to the loss of efficiency that results when residents are not managed in groups (e.g., all residents eat in dining room). Investigators will discuss some of these issues in the Future Directions section of this chapter.

14.7 Methodology and Analysis Strategy

14.7.1 Analytical Approach Simulation Logic

To estimate the number of staff needed to provide all recommended efficacious care to residents, investigators developed a computer simulation of the process of delivering care. Simulation is a flexible tool that is especially appropriate for evaluating the effects of physical layout, staffing levels, and service scheduling on the level of services provided, resident waiting time, and staff workload. Simulation has been used as an analytic tool in many areas of health care, including emergency departments,[79] operating rooms/surgical suites,[80,81] clinic applications,[82,83] and inpatient applications.[84,85] MedModel™,

a PC-based program, allowed us to model both the physical layout of a typical nursing unit and characteristics of the residents. Simulation has the advantage of allowing us to model several realistic scenarios, including factors such as:

- observed variation in time to deliver a service;
- aide travel time from one resident to another;
- the need to accommodate breaks for staff;
- the fact that some services (i.e., morning care and meals) must be delivered in a relatively narrow time window, while others (e.g., showers, putting away laundry, and exercise) can be worked into available slack periods during the day;
- the need to accommodate unscheduled events, which may occur at different rates through the day.

The output of the program included shift-by-shift estimates of workload estimates of time spent in direct resident care and in travel, estimates of the total minutes devoted to each of the recommended services, and the approximate time of day when time-critical services were completed on all residents.

For the physical layout, investigators used a 40-bed nursing unit with a T-shaped floor plan and a centrally located nursing station and dining hall. Each branch of the T was equipped with a bathroom with a shower. Investigators assumed that toilets and sinks were available in each resident room.

Based on resident characteristics, investigators created a schedule of recommended services and the estimated times to complete them. Nurse aides were assigned to typical shifts, with two scheduled 15-minute breaks and a 30-minute meal period. The simulation of a 24-hour period involved:

- the arrival and departure of staff, with five minutes for shift reports at the beginning and end of each 8-hour shift and breaks occurring as close to their scheduled times as possible without interrupting already in-progress service to a resident;
- provision of scheduled services, with aides traveling from one resident to the next to deliver care, spending the estimated times appropriate to each resident type;
- in some scenarios, the addition of random, unscheduled demands for services (representing resident call lights, spills, accidents, and similar events).

14.8 Resident Service Categories and Staffing Model Input Data

Table 14.2 provides time and frequency estimates for five evidence-based care processes that nurse aides perform. These estimates are provided for each of six major categories of residents. Investigators divided residents into these six categories by considering the care processes that residents receive because of either their disabilities or projected responsiveness to the care protocols (e.g., toileting). The columns of the table illustrate, for each of the five evidence-based care processes, the time required to complete the process and the minimum frequency for providing the services. All of the numbers in these columns were justified and more fully described in the Review of Literature section of this paper.

The first two rows of the table (groups 1 and 2) illustrate residents who are ambulatory without human assistance, whom investigators project to be approximately 30% of the NH population. These residents are equally divided into 14% who need no assistance with ADLs (Row 1) and those who need independent ADL enhancement care. This number was based on data that suggests that 14% of NH residents are independent in all ADL areas and that approximately 85% need assistance with dressing.[63] Investigators project that none of the residents in these first two categories would need incontinence care since immobility is a primary risk factor for urinary incontinence. Likewise, these residents, by definition, do not need human assistance with repositioning. However, all of these ambulatory residents would need exercise for 30 minutes every two days (3.5 times per week or .5 times per day).

Groups 3 through 6 in Table 14.2 are all incontinent and would need incontinence care, exercise integrated with incontinence care, and ADL enhancement exercise. Differences in the time devoted to incontinence care in these four groups is primarily due to Group 3's ability to be responsive to a toileting program that is more time-consuming than changing.

Table 14.2 Frequency and Time Input Data for Care Processes (Ideal Staffing)

Patient type	% of Residents	a.m. CARE		EXERCISE		CHANGE OR TOILETING		REPOSITIONING		GROUP FEEDING ASSISTANCE		SHOWER		p.m. CARE		HOUSEKEEPING	
		Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency
1. Continent, Independently ambulatory, no diapers, no need for repositioning, no need for ADL enhancements, fully independent eating Frequency: 15% (6 of 40)	15.0%	2	1 per day	30	Every other day	0	0	0	0	1	3 per day	15	Every fourth day	2	1 per day	5	2 per day
2. Continent, Independently ambulatory, no diapers, no need for repositioning, ADL enhancements needed, fully independent eating Frequency: 15% (6 of 40)	15.0%	11	1 per day	30	Every other day	0	0	0	0	1	3 per day	15	Every fourth day	11	1 per day	5	2 per day
3. Incontinent, Assisted ambulation, day toilet/night diapers, repositioning needed, ADL enhancements needed, fully independent eating Frequency: 20% (8 of 40)	20.0%	14	1 per day	6	3 per day	7-day, 5-night	7 per day	3.5	3 per day	1	3 per day	15	Every fourth day	14	1 per day	5	2 per day
4. Incontinent, Assisted ambulation, 24 hour diapers, repositioning needed, ADL enhancements needed, semi dependent eating Frequency: 40% (16 of 40)	40.0%	14	1 per day	6	3 per day	5	8 per day	3.5	2 per day	7.5 (in groups of 4)	3 per day	15	Every fourth day	14	1 per day	5	2 per day
5. Incontinent, Assisted ambulation, 24 hour diapers, repositioning needed, ADL enhancements needed, dependent eating Frequency: 4.5% (2 of 40)	5.0%	14	1 per day	6	3 per day	5	8 per day	3.5	2 per day	22.5 (in groups of 2)	3 per day	15	Every fourth day	14	1 per day	5	2 per day
6. Incontinent, Bed bound, 24 hour diapers, repositioning needed, ADL enhancements needed, dependent eating Frequency: 5.0% (2 of 40)	5.0%	14	1 per day	2	3 per day	5	8 per day	3.5	2 per day	22.5 (in groups of 2)	3 per day	15	Every fourth day	14	1 per day	5	2 per day
Average time per patient (over all patients):		11.75		16.50		28.40		5.60		17.25		3.75		11.75		10.00	
Total = 95 minutes																	

Note: Shift report time (10 minutes per day) is not presented I this table which illustrates care frequency per day and time on a per-resident basis. A total of 10 minutes of aide time for all residents is assigned to shift report and documentation. The a.m. and p.m. care does not include incontinence care, and repositioning may be combined with toileting or changes

All six groups of residents receive the same bathing assistance (e.g., shower every four days) and ten minutes is allowed per resident for such

housekeeping duties as changing bed linens, replenishing supplies, and managing laundry.

Investigators decided to distribute the 50% of residents whom they predict will need feeding assistance across the three highest acuity groups (Groups 4, 5, and 6) based on the assumption that there is a positive association between the need for feeding assistance and the extent of other ADL limitations. Following this logic, investigators placed all residents who need complete assistance with feeding (estimated 10%) in the two highest acuity groups (Categories 5 and 6) and residents who need prompting or minimal assistance in Group 4. In the "efficient environment" care scenarios investigators modeled (Scenarios A and B), morning care is completed before breakfast and residents are brought to the dining room to be fed. This allows an aide to simultaneously feed four semi-dependent residents over a 30-minute period or two dependent residents over a 45-minute period. These group feeding models are also used for lunch and dinner.

14.9 Simulation A and B: Minimal Number of Staff Necessary to Provide all Services

Investigators first simulated a work-scheduling scenario that would allow for the minimum staff to provide all recommended care listed in Table 14.2 to 100% of the residents. This required us to begin a.m. care at 6:00 a.m. with, at least, some people and to use part-time aides during peak times (6:00 a.m. to 10:00 a.m., 12:00 p.m. to 4:00 p.m., 5:00 p.m. to 9:00 p.m.). All residents were fed in the dining room so that efficient feeding assistance could be offered. Any other staffing distribution resulted in less efficiency (e.g., more staff were needed to provide care and/or there was increased idle time on the part of the staff who were present). The major difference between Scenario A and B was that in Scenario B investigators allowed for a low volume of demands for unscheduled service. These unscheduled requests were assumed to take 5 to 16 minutes, with an average time of ten minutes required. Requests or other needs for assistance were programmed to occur probabilistically, with an average of four requests coming from 11:00 p.m. to 7:00 a.m. and 16 requests coming in from 7:00 a.m. to 11:00 p.m. In other words, the 40 residents in the investigators' sample generated an average of 0.5 requests per 24-hour period.

14.10 Simulations to Identify Outcomes of Less-Than-Ideal Staff

Scenarios C and D were designed to reflect the outcomes of a more typical NH staffing level. Investigators projected a ratio of 10 residents to one aide on the 7:00 a.m. to 3:00 p.m. shift, 13.3 residents to one aide on the 3:00 p.m. to 11:00 p.m. shift, and one person for 40 residents on the 11:00 p.m. to 7:00 a.m. shift. A variant with two aides on the 11:00 p.m. to 7:00 a.m. shift (ratio: 20 residents per aide) was also modeled. The investigators' intent with these scenarios, once again, was to maximize the amount of care that can be delivered with the available staffing time. However, in these scenarios the frequency of some processes had to be reduced from the recommended level (less repositioning or toileting) and the time it takes to provide a service also had to be reduced from the recommended level (e.g., feeding assistance times). These reductions were necessary to reflect the

reduced time available to provide care. Investigators specifically illustrate these reduced times and frequencies that were necessary for the reduced staffing model in Table 14.3.

Table 14.3 Frequency and Time Input Data for Care Processes (Lower Staffing)

Patient type	% of Residents	a.m. CARE		EXERCISE		CHANGE OR TOILETING		REPOSITIONING		GROUP FEEDING ASSISTANCE		SHOWER		p.m. CARE		HOUSEKEEPING	
		Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency	Time	Frequency
1. Continent, Independently ambulatory, no diapers, no need for repositioning, no need for ADL enhancements, fully independent eating Frequency: 15% (6 of 40)	15.0%	2	1	20	0.5	0	0	0	0	1	3	15	0.125	2	0	5	1
Sd\Frequency Unit			per day		4Xweek						per day		2Xweek		per day		per day
2. Continent, Independently ambulatory, no diapers, no need for repositioning, ADL enhancements needed, fully independent eating Frequency: 15% (6 of 40)	15.0%	8.25	1	20	0.5	0	0	0	0	1	3	15	0.125	5.5	1	5	1
Sd\Frequency Unit		7	per day		4Xweek						per day		2Xweek	7	per day		per day
3. Incontinent, Assisted ambulation, day toilet/night diapers, repositioning needed, ADL enhancements needed, fully independent eating Frequency: 20% (8 of 40)	20.0%	9.5	1	4	2	6	5	3.5	2	1	3	15	0.125	7	1	5	1
Sd\Frequency Unit		7	per day		per day	7-day, 5-night, Sd-2	per day		per day		per day		2Xweek	7	per day		per day
4. Incontinent, Assisted ambulation, 24 hour diapers, repositioning needed, ADL enhancements needed, semi dependent eating Frequency: 40% (16 of 40)	40.0%	9.5	1	4	2	5	5	3.5	2	4.4	3	15	0.125	7	1	5	1
Sd\Frequency Unit		7	per day		per day	2	per day		per day	groups of 4	per day		2Xweek	7	per day		per day
5. Incontinent, Assisted ambulation, 24 hour diapers, repositioning needed, ADL enhancements needed, dependent eating Frequency: 4.5% (2 of 40)	5.0%	9.5	1	2	2	5	5	3.5	2	10.25	3	15	.0125	7	1	5	1
Sd\Frequency Unit		7	per day			2	per day		per day	groups of 2	per day		2Xweek	7	per day		per day
6. Incontinent, Bed bound, 24 hour diapers, repositioning needed, ADL enhancements needed, dependent eating Frequency: 5.0% (2 of 40)	5.0%	9.5	1	2	2	5	5	3.5	2	10.25	3	15	0.125	7	1	5	1
Sd\Frequency Unit		7	per day			2	per day		per day	groups of 4	per day		2Xweek	7	per day		per day
Average time per patient (over all patients):		8.19	1.0	8.4	1.55	18.5	3.5	4.9	1.4	9.86	3.0	1.88	0.13	5.73	.85	5.0	1.00

Total =57.44 minutes Note: Shift report time (10 minutes per day) is not presented in this table which illustrates care frequency per day and time on a per-resident basis. A total of 10 minutes of aide time for all residents is assigned to shift report and documentation. The a.m. and p.m. care does not include incontinence care, and repositioning may be combined with toileting or changes

14.11 Results

14.11.1 Scenario A: Full- and Part-time Staff: 13.5 FTE per Day, No Unscheduled Care

Investigators first ran the model assuming that there were no resident-initiated care needs (i.e., no "call lights"). This allowed us to schedule all the recommended care in what is undoubtedly an unrealistically efficient manner using the following staff:

Full-time Shifts		*Part-time Shifts*	
7:00 a.m. to 3:00 p.m. shift	5 people	6:00 a.m. to 10:00 a.m.	3 people
3:00 p.m. to 11:00 p.m. shift	4 people	12:00 p.m. to 4:00 p.m.	1 person
11:00 p.m. to 7:00 a.m. shift	1 person	5:00 p.m. to 9:00 p.m.	2 people
		1:00 a.m. to 5:00 a.m.	1 person

Resulting hour by hour ratios:

11:00 p.m. to 1:00 a.m.	1 aide per 40 residents (ratio = 40 residents per aide)
1:00 a.m. to 5:00 a.m.	2 aides per 40 residents (ratio = 20 residents per aide)
5:00 a.m. to 6:00 a.m.	1 aide per 40 residents (ratio = 40 residents per aide)
6:00 a.m. to 7:00 a.m.	4 aides per 40 residents (ratio = 10 residents per aide)
7:00 a.m. to 10:00 a.m.	8 aides per 40 residents (ratio = 5 residents per aide)
10:00 a.m. to 12:00 p.m.	5 aides per 40 residents (ratio = 8 residents per aide)
12:00 p.m. to 3:00 p.m.	6 aides per 40 residents (ratio = 6.67 residents per aide)
3:00 p.m. to 4:00 p.m.	5 aides per 40 residents (ration = 8 residents per aide)
4:00 p.m. to 5:00 p.m.	4 aides per 40 residents (ratio = 10 residents per aide)
5:00 p.m. to 9:00 p.m.	6 aides per 40 residents (ratio = 6.67 residents per aide)
9:00 p.m. to 11:00 p.m.	4 aides per 40 residents (ratio = 10 residents per aide)

The *average* staffing ratios are:	from 7:00 a.m. to 3:00 p.m.	6.4 residents per aide
	from 3:00 p.m. to 11:00 p.m.	8.1 residents per aide
	from 11:00 p.m. to 7:00 a.m.	26.25 residents per aide

In Scenario A, all residents receive all recommended care, as listed in Table 14.2. This meant that the *average* NH resident in the simulation received 95 minutes of recommended direct care services per day plus an additional 10 minutes of housekeeping services:

Exercise/range of motion	16.5 minutes
Changing/toileting/repositioning	34.0 minutes
Feeding assistance	17.25 minutes
Morning and evening care, showering	27.25 minutes
Housekeeping services	10.0 minutes

In the simulation, services were scheduled to minimize resident delays; but even so, shift changes and limits on the number of staff available led to interruptions in care for some residents, averaging about 5 minutes per resident per day.

When part-time aides are used, more aides are available to deliver care during "peak" times, such as the early morning and meal times. Under this scenario, morning care began at 6:00 a.m. (probably acceptable to some residents) and was completed on all residents by 7:56 a.m. All three meals were completed within their scheduled one-hour time period. Evening care was completed by 7:45 p.m. (Note: An alternative scenario was tried starting morning care at 7:00 a.m. with the morning part-time shift running from 7:00 a.m. to 11:00 a.m. Under this scenario, two *additional* morning part-time staff [a total of 10 aides available from 7:00 a.m. to 11:00 p.m!] were needed to complete morning care by 8:20 a.m. This delayed the start of breakfast, although under the group feeding assumptions, breakfast was completed by 9:00 a.m.).

Investigators assumed that full-time staff with an 8-hour (480 minute) scheduled shift were available to provide care for 7 hours (420 minutes). Investigators assumed a 30-minute meal period and two 15-minute breaks, which were staggered. Part-time staff were available to provide 3.5 hours of care (scheduled for 4 hours with one 30-minute break). Each staff member was assumed to spend 5 minutes at the end of the shift and 5 minutes at the beginning of the shift giving report, receiving assignments and doing paperwork. In this scenario, all staff members combined worked about 143 minutes of overtime (a little more than 10 minutes per FTE) each day. This overtime was related to completing a resident task begun just before the end of the shift.

In this scenario, the staff was engaged in direct resident care nearly 75% of the time (Column 1 Table 14.4). In other words, about 45 minutes of direct resident care was provided per 60 minutes of *available* work time. In addition, staff spent approximately 5 minutes per hour walking to and from resident rooms to provide care, so that on average staff, were not engaged in work activities about 17% of the time. They were either providing direct care or walking to residents' rooms for 49 minutes per *available* hour or 43 minutes per *scheduled* hour. These numbers varied by shift, as shown in Table 14.4.

Table 14.4 Staff workload for Scenario A: 13.5 FTEs No Unscheduled Events Based on 7 (3.5) Available Hours per 8 (4) Hour Shift					
Shift	% Time in direct care	% Time in care + travel to/from care	% Time not engaged in work activ.	Minutes Direct care + travel/avail.hour	Minutes Direct care/avail hour
8 Hour Shifts:					
7 a.m. to 3 p.m.	73.8	81.1	18.9	49	44
3 p.m. to 11 p.m.	81.9	90.5	9.5	54	49
11 p.m. to 7 a.m.	54.3	60.0	40.0	36	33
4 Hour Shifts:					
6 a.m. to 10 a.m.	75.5	83.4	16.6	50	45
Noon-4 p.m.	67.8	75.4	24.6	45	41
5 p.m. to 9 p.m.	82.2	91.3	8.7	55	49
1 a.m. to 5 a.m.	62.1	68.1	31.9	41	37
Overall	74.8	82.5	17.5	49	45

14.11.2 Scenario B: Full- and Part-time Staff: 13.5 FTE per Day, Low Volume Unscheduled Events

Scenario B was run exactly like Scenario A, *except* that a low volume of resident-initiated calls or unscheduled work was introduced. These "call-light" requests were assumed to take 5 to 16 minutes, with an average time of 10 minutes required. Call-light requests occurred probabilistically, with an average of 4 requests coming in from 11:00 p.m. to 7:00 a.m. and 16 requests coming in from 7:00 a.m. to 11:00 p.m. In other words, residents generated an average of 0.5 requests per 24-hour day. For each variation on this scenario, 200 days of care were simulated.

Even with this low volume of unscheduled tasks, the effects on resident care were noticeable. On 15% of the 200 simulated days, staff were simply unable to complete all the recommended care. On days when all care was able to be delivered, staff overtime averaged 16 minutes for each FTE. To consistently provide all resident care under Scenario B, it was necessary to improve staffing to 14.5 FTE as compared to 13.5 FTE for Scenario A. When unscheduled calls for care were doubled to an average of one episode per resident per day, the Scenario B staff of 13.5 FTE could only complete all recommended care on slightly less than half of the simulated days and two additional FTE were needed

to enable the staff to consistently provide all recommended services.

In addition, staff workload increased under Scenario B, so that aides were occupied with direct care about 78% of the time and were either giving care or walking to resident rooms more than 86% of the time. Details are shown in Table 14.5.

Table 14.5 Staff workload for Scenario B: 13.5 FTEs with Unscheduled Events Based on 7 (3.5) Available Hours per 8 (4) Hour Shift

Shift	% Time in direct care	% Time in care + travel to/from care	% Time not engaged in work activ.	Minutes Direct care + travel/ avail. hour	Minutes Direct care/avail hour
8 Hour Shifts:					
7 a.m. to 3 p.m.	76.3	83.6	16.4	50	46
3 p.m. to 11 p.m.	83.5	92.4	7.6	55	50
11 p.m. to 7 a.m.	62.9	68.6	31.4	41	38
4 Hour Shifts:					
6 a.m. to 10 a.m.	79.0	86.9	13.1	52	47
Noon-4 p.m	74.0	81.9	18.1	49	44
5 p.m. to 9 p.m.	87.9	97.0	3.0	58	53
1 a.m. to -5 a.m.	71.9	77.9	22.2	47	43
Overall	**78.3**	**86.1**	**13.9**	**52**	**47**

14.11.3 Scenario C: Full- and Part-time Staff: Eight FTE per Day, No Unscheduled Events

The staffing was reduced to a pattern that may be typical in some NHs and no resident-initiated calls were allowed.

Full-time Shifts

7:00 a.m. to 3:00 p.m. shift	4 people	ratio: 10 residents per aide
3:00 p.m. to 11:00 p.m. shift	3 people	ratio: 13.33 residents per aide

11:00 p.m. to 7:00 a.m. shift 1 person ratio: 40 residents per aide

A variant with 2 aides on the 11:00 p.m. to 7:00 a.m. shift (ratio: 20 residents per aide) was also modeled. In this scenario, investigators followed the typical NH practice of beginning morning care at 7:00 a.m.

In Scenario C, care was scheduled to maximize the amount of care that could be delivered within the staffing time. The frequency of some services was reduced from the recommended frequency (e.g., repositioning, toileting, and showering) while the time taken to provide the service was reduced from the recommended level for others (e.g., feeding assistance, morning and evening care, exercise). Range of Motion exercises were reduced both in frequency and in time. These service reductions are listed in Table 14.3.

The details of the services actually delivered under Scenario C are shown in Table 14.6.
In Scenario C the *average* NH resident in the simulation received 57.4 minutes of direct care per day plus an additional 5 minutes of housekeeping services. This is about 60% of the recommended care.

Exercise/range of motion	8.4 minutes (50.9% of recommended)
Changing/toileting/repositioning	23.4 minutes (68.8% of recommended)
Feeding assistance	9.9 minutes (57.4% of recommended group feeding)
Morning and evening care, showering	15.8 minutes (58.0% of recommended)
Housekeeping services	5.0 minutes (50% of recommended)

The feeding assistance level is 57.4 % of the recommended level with group feeding; however, this overstates the quality of care. In this scenario, only about 40% of the residents had completed morning care by 8:00 a.m., so many residents had to be fed in their rooms. For these residents who are forced to receive one-on-one assistance, the recommended times are actually two to four times higher than the group feeding times.

The actual mix of care delivered was somewhat arbitrary. The time spent toileting residents could have been reduced and more time added to exercise. However, the total care delivered represents a realistic bound given the staffing ratios used: the staff workload was very high during the simulation runs.

In Scenario C, adding an additional staff member to the 11:00 p.m. to 7:00 a.m. shift did not actually result in more care being delivered to residents. This is due to the restrictions placed on when certain services can be provided. If morning care could start earlier, at 6:00 a.m. for example, then adding an additional night shift person could increase the total care delivered by three minutes per resident per day. Similarly, if the night shift could do certain housekeeping services, day and evening staff could deliver more direct care, such as feeding assistance, exercise, and grooming.

In this scenario, the day and evening shift staff are providing direct care about 80% of the time (Table 14.6). When the time walking to and from care is added in, day and evening shift aides are not engaged in work activities 7.9% and 4.7% of the time, respectively. The night shift business depends, of course, on whether one or two aides are available. With only one night shift aide (a ratio of 40 to 1), the night shift is not engaged in work activities only about a quarter of the time. With two night shift aides (a ratio of 20 to 1), the night shift is not engaged in work activity more than half the time.

Table 14.6 Staff Workload for Scenario C: 8 or 9 FTEs with Unscheduled Events Based on 7 Available Hours per 8 Hour Shift					
Shift	**% Time in direct care**	**% Time in care + travel to/from care**	**% Time not engaged in work activ.**	**Minutes Direct care + travel/ avail. hour**	**Minutes Direct care/avail hour**
With total of 8 FTEs					
7 to 3	79.1	92.1	7.9	55	47
3 to 11	81.3	95.3	4.7	57	49
11 to 7 (1 aide)	71.0	78.5	21.6	47	43
Overall w/8 FTEs	78.9	91.6	8.4	55	47
With one additional FTE on 11 to 7					
11 to 7 (2 aides)	38.1	43.4	56.6	26	23
Overall w/9 FTE	70.19	81.8	18.23	49	42

The workloads in Scenario C leave no time for responding to call lights or other unscheduled events. Adding unscheduled events, as investigators saw in Scenario B, decreases the chance that all of the scheduled care can be accomplished. Very likely, real human beings being asked to deliver the simulated care under these conditions will cut corners and actually deliver even less direct resident care.

The situation could be improved by adding another staff person to the day shift, bringing the ratio for that shift up to 8 residents per aide. At best, this would result in about 8 additional minutes of care per resident, or a total of about 65 minutes per resident, still less than 70% of the recommended care.

14.12 Conclusions

1. Investigators estimate that 13.5 to 15.5 FTE's for a 24-hour period are necessary to complete all care under conditions of high efficiency and nurse aide work productivity. The higher FTE's would occur when the possibility of a moderate level of unscheduled care demands for service are considered. In all models, the amount of time that aides were not involved in direct care was extremely low and potentially even reflects unrealistically high levels of on-task work performance for a healthcare worker. Even in highly regimented workplaces, workers will

typically spend 5% to 10% of their time in personal activities, such as going to the bathroom, greeting a co-worker, getting a drink of water.[86] In more complex tasks such as the nursing aides face, some additional time needs to be spent in planning the next activity, gathering supplies and equipment, and in participating in staff education programs.[87,88] High on-task productivity is also reflected by the high numbers of service minutes that each resident would receive for these ideal staffing models. This average of 105 minutes is much closer to those service minutes reported by the RUGs studies (139 nurse aide minutes per resident) than those reported by the Holmes study (approximately 45 minutes per resident). To provide 139 minutes of direct resident care per resident per day, the staff of 13.5 FTE for 40 residents would have been busy with direct resident care an unbelievable 98% of their available hours, leaving 2% of their time for travel to and from care and all other personal activities. The shift resident-to-aide ratios that the 13.5 to 15.5 FTE's represent would be 5.2 to 6.4, 7:00 a.m. to 3:00 p.m. shift, 7.6 to 8.1, 3:00 p.m. to 11:00 p.m. shift, 26.0 to 26.25, 11:00 p.m. to 7:00 a.m. shift.

2. The outcomes in the reduced staffing model suggest that a low level of care will occur with the staffing ratios that exist in many NHs, despite high productivity that continue to characterize the reduced staffing model. In these conditions, it is clear that aides must "cut corners" and make arbitrary decisions about what care to provide and who to provide it to. One observational study that described nurse aide work performance, documented that these types of efficiency decisions are routinely made by nurse aides in the course of their daily work.[89] The resident care outcomes that investigators predict from this model also appear to be consistent with observational studies that they have described in the literature review. These observational studies, which have not relied upon NH-generated data, have documented extremely low levels of incontinence care and particularly the more time consuming incontinence care involving toileting assistance.[13,20] The low levels of exercise assistance (also time consuming) and sporadic feeding assistance characterized by excessive use of physical assistance, which have also been described in these observational studies, appear consistent with the outcomes predicted by Scenario C.[20,71,41,48,49]

14.13 Limitations and Future Directions

14.13.1 Investigators Excluded Important Care Processes from the Staffing Projections

Investigators were given the task of estimating nurse aide staffing resources needed to implement care processes that improve outcomes. To accomplish this objective, investigators had to develop inclusion criteria that went beyond "opinion" to define an efficacious care practice (see page 14-3). These criteria led us to exclude some processes that many experts believe are important for high quality NH care. The most controversial excluded processes were those designed to improve quality of life and to

manage behavioral and mood disturbance problems; there is widespread opinion and some evidence that there are effective interventions in both areas. On a separate note, investigators believe they may have underestimated the amount of time nurse aides need to perform necessary tasks that are unrelated to specific outcomes. With respect to all these issues, investigators have several major points to make.

The first and most important point is that the five protocols investigators included in the investigators' analyses feature intervention components that are conceptually related to quality of life. These components are integrated with staff assistance in protocols that address residents' need for physical activity, incontinence care, and feeding and dressing assistance. This same point led us to argue in the introduction that a distinction between quality of care and quality of life is both arbitrary and misleading. Investigators will elaborate on the point here.

All care processes that met the investigators' inclusion criteria involve significantly increased personal contact between residents and NH staff. The literature review documented the extent to which this personal contact exceeds contact under "usual care" conditions for the protocols pertaining to feeding assistance, ADL dressing enhancement, and incontinence management. If one believes that increased social interaction and personal contact between residents and NH staff can improve residents' perceptions of life quality and/or their agitation and mood, then measures of these outcomes should also improve following implementation of the five care protocols that met the investigators' inclusion criteria.

In addition, care provided under the exercise, incontinence, and feeding assistance protocols is consistent with resident preferences (e.g., incontinence care and exercise are offered frequently enough to meet resident preferences) and allows residents to maximize their independence. To the extent that quality of life is improved by providing care consistent with personal preferences or independence enhancement, then the five protocols that met the investigators' inclusion criteria are related to improved life quality.

To illustrate these points, consider the Functional Incidental Training (FIT) exercise protocol that investigators are recommending for the approximately 70% of NH residents who are incontinent.[67] This intervention has been shown to improve dryness rates, physical activity levels, and mobility performance measures. It also, however, provides approximately 15 minutes of contact every two hours between a nurse aide and a resident; over a 12-hour shift, that amounts to approximately 53 minutes more than is observed during usual care. In addition, FIT significantly reduces agitation as well as delivers incontinence and mobility assistance at a frequency consistent with many residents' preferences. When combined with a nighttime intervention that individualizes incontinence care, FIT also improves sleep.[90] Investigators are currently evaluating whether this protocol improves residents' and families' reported perceptions of life quality. But even with just the available data, a strong case can be made that the protocol improves both functional measures and measures of behavioral disturbance.

Regarding a second point about the investigators' care process selection, it can be argued that NH residents should receive even more social-interaction time than the five protocols provide and that this additional time should be devoted exclusively to social interaction. For example, in addition to receiving feeding assistance in a group or individualized setting for 30 minutes, perhaps each resident should also be engaged in conversation following each meal. This is an interesting hypothesis, but there are no data to suggest what outcomes such a protocol would produce, much less specific information about how long the social-interaction-only sessions should be (an important cost issue).

Investigators also considered the possibility that social stimulation and resident involvement in activities completely independent of any other care process might be efficacious. In this regard, investigators reviewed two separate groups of evidence.

Several studies reported mixed but some positive results when residents were given a specific stimulation protocol (e.g., human interaction, audio tape) whenever they displayed agitation symptoms.[91,92,93] Investigators did not include these protocols in their staffing simulations due to uncertainty about their efficacy if implemented over time. A key, unanswered question is, "Would residents cease to be attentive to these stimulation procedures, given that the duration of the effects were reportedly limited to the time that the agitation was occurring?" Investigators do not discount the clinical importance of even a temporary reduction in agitation, but investigators believe these results should be further replicated before the protocols are recommended for NH use. These replication studies should be conducted with attention to documenting maintenance effects and nurse-aide labor requirements, which will certainly increase because other care activities will have to stop so that nurse aides can provide stimulation to agitated residents. These time costs will increase even when stimulation is provided via audio tapes.

Another study reported that a multi-faceted intervention combining medication review, a geropsychiatrist consult, and an activity program resulted in improved measures of behavioral disturbance and mood.[94] The intervention's most labor-intensive feature involved non-licensed staff (activity staff) who performed work outside the normal scope of work for nurse aides. In this study, staff cost to treat 20 residents for six months was $13,200.00. This study is important, but its implications for nurse aide staffing are unclear. If the intervention were implemented, nurse aides probably would not be freed from other responsibilities (e.g., residents would still need incontinence care), but rather new activity staff would have to be hired. Furthermore, depending on the number of residents participating in the intervention, the staffing costs could be very high.

In short, investigators believe there is evidence that social stimulation and activity/ engagement interventions can produce improvements in behavioral disturbance and mood. However, it is unclear whether social activity beyond those levels provided in the five protocols that investigators have included for analysis is necessary to produce beneficial effects. Assuming such "extra" social stimulation were necessary, it is unclear who should deliver that additional care or what it will cost.

Based on their own clinical experience, investigators believe the most logical approach is to maximize appropriate social interaction between nurse aides and residents while other necessary care is also being provided. Staff who are not consumed by the physically demanding care tasks typically required of nurse aides (e.g., activity staff, social service personnel, volunteers, etc.) could more efficiently provide residents with additional social stimulation when needed.

With respect to a third and final point, investigators noted previously that nurse aides perform tasks that may be unrelated to specific outcomes but are nevertheless necessary. In their staffing model, investigators estimated that such tasks consume 30 minutes per day. Investigators believe, however, that investigators have underestimated the time needed to perform these tasks according to high quality standards. Unfortunately, defensible data upon which to base such "high quality" time estimates are currently unavailable, though efforts are underway to correct this problem. Consider, for example, the assessment activities involved in completing the MDS and Resident Assessment Protocols (RAPs). The investigators' staffing model does not include time for these activities beyond what might be needed to complete shift reports simply because investigators could find no data about how much time nurse aides spend in these activities. Currently, investigators are collecting information on the labor requirements associated with completing the MDS and RAP nutrition items. The investigators' preliminary data suggest that it takes 20 to 30 minutes of nurse-aide time per day just to record MDS food intake items accurately and to implement all the RAP assessment recommendations for residents identified as at risk for potential nutritional problems.

Investigators did not include this time estimate in their "other care" category because the clinical value of some of the assessments are unclear, and the data are preliminary. In other articles, investigators have argued that practice-guideline and RAP recommendations in multiple areas should be implemented under controlled conditions so that the cost-effectiveness of each recommendation can be determined.[95,96] Based on their preliminary data, however, investigators believe that some practice-guideline and RAP recommendations will prove to have high clinical utility and that significantly more nurse-aide time than investigators have projected in their staffing models will be needed to accurately complete these assessments.

14.13.2 The Labor Requirements of Individualizing Care Was Not Simulated in the Staffing Models.

Investigators did not project the staffing requirements associated with individualizing care in part because it is beyond their scope of work but also because it is not possible to do so with the data currently available. Investigators believe this topic is extremely important, however, and when data describing residents' preferences for daily care are available, staffing simulations should be conducted to determine the labor requirement of meeting those preferences.

Despite the absence of data about the time costs or outcomes that would result from individualized care

interventions, there is consensus that providing care based on residents' preferences is an important aspect of quality. Indeed, the ACOVE Expert Consensus Panel confirmed the importance of individualization for life quality with two indicators:

1. **IF** a vulnerable elder is admitted to a NH,
   THEN, within 2 weeks, the resident's preferences for daily life activities in all of the following areas should be assessed and documented in the record:
   - sleep schedule
   - meals
   - roommates
   - telephone access
   - participation in activities
   - spirituality
   - privacy

2. **IF** a NH resident can provide stable and realistic preference information about daily-life activities that are related to quality of life,
   THEN the degree to which these preferences are being met should be monitored at least quarterly after admission.

Despite the lack of data to document a process-outcome link for these indicators, they were rated as clinically valid and important because of the ACOVE panel's belief that individualized care is intuitively linked to high quality. It is possible to test the validity of this intuition.

Assessing residents' preferences is an initial step to operationalizing the concept of individualization. Investigators are currently conducting such research and are confident that stable preferences describing activities of daily living (e.g., time out of bed, dining location) can be obtained from 40% to 62% of residents, depending on the care domain for which the preference is being elicited. What is less clear at this stage are the following points:

1. How are decisions to be made about individualized care when a resident's preferences seem unhealthy (i.e., a resident reports a preference to stay in bed all day and never exercise)?

2. How much do resident preferences change when monitored daily, and how do you calculate the staffing cost of such variability? For example, if a resident is allowed to decide when to get out of bed each day, how will this decision vary from day to day and how do you allocate staffing resources so that they are flexible enough to accommodate this variability?

3. How is daily care individualized when a resident's preferences cannot be determined?

Investigators are conducting preliminary research designed to answer these questions; soon, investigators should be able to simulate the labor requirements of specific nurse-aide work schedules that can accommodate individual preferences. Investigators anticipate these preliminary data will show that significantly more staff resources than those projected in this chapter are needed to individualize care. This prediction takes into account that the work scheduling scenarios investigators simulated in this chapter were based on time-efficiency concerns that can be inconsistent with work schedules designed to accommodate individual preferences. For example, previously investigators reported data showing that 26% of a small subset of 19 residents with low food intake preferred to eat in their rooms. The cost of individualizing care consistent with this preference would be high because each resident separately would need feeding assistance, at an estimated cost of 20 to 30 minutes per resident versus the 30 minutes needed to assist the entire group. Nurse aides in one study reported lack of "time" as a major barrier to individualizing care.[97]

Alternatively, identifying and satisfying resident preferences may result in some cost reductions. For example, it is likely that at least some of the residents projected to receive exercise under the investigators' simulations do not really want to exercise. Since exercise is a relatively time-consuming care activity, labor savings could result from honoring these residents' preferences.

In short, it is technically feasible to define individualized-care work schedules based on residents' preferences and to project the staffing resources needed to implement these care processes. This work would greatly improve our understanding of how individualized care principles can be operationalized in practice and would be a logical extension of the analyses begun in this chapter.

14.13.3 Investigators Did Not Report Staffing Requirements Needed to Compensate for Poor Management and High Staff Turnover.

Investigators projected the staffing resources needed to implement high quality care under work conditions characterized as both efficient and productive, even though there is strong reason to believe that the NH environment is not conducive to such work conditions. Investigators considered simulating staff models that accounted for poor management and high staff turnover in two ways:

1. Reduce the amount of time that nurse aides have available to provide care, to less than the approximately 42 to 46 minutes per hour that investigators used in their staffing simulations. This correction would assume that poorly managed aides work inefficiently and spend less time than they have available providing direct care.
2. Increase the amount of time needed to implement each of the five protocols to accommodate for new staff who are learning on the job (e.g., increase the amount of time needed to complete ADL morning care from 20 minutes to 25 minutes).

Either of the above corrections would increase the number of nurse aides needed to provide high

quality care beyond the numbers projected in this chapter. Investigators did not make either correction in part because of inconsistent data about nurse-aide productivity but also due to conceptual reasons.

With respect to inconsistent data, consider the mixed results investigators reported in the chapter subsections Input Variables Estimating Amount of Time Aides Have Available to Provide Care and Review of Literature Describing Process-Outcome Relationships and Labor Requirements. Data from the RUGs studies, which report how many minutes of care residents receive from nurse aides, suggest either very high staff productivity or high staffing levels, as do two observational studies that reported nurse aides are often observed in direct care activities.[74,75,77] By contrast, the time study conducted by Holmes, et.al. (In Press), which documented that nurse aides provide only 44.8 minutes of care per resident in a 24-hour period, suggests either extremely low staffing or low productivity. Supporting the Holmes data are other observational studies that have described surprisingly low frequencies of incontinence care, mobility assistance, and feeding assistance.[13,20,71,41] In short, the available data provide no clear direction about how to determine the efficiency and productivity of nurse aides under current NH work conditions. A case could be made for assuming either high or low productivity as a typical NH work scenario.

The second reason for not simulating staffing needs under conditions of poor management was conceptual. Investigators do not believe that financial managers will increase staff beyond those needed to provide care under good management assumptions just to compensate for bad management. The most typical and appropriate approach to the problem is to identify the labor resources needed to provide care under good management and then create the management conditions that lead to efficient use of these labor resources.

There also is strong reason to believe that NH work conditions are not conducive to motivating staff to be either highly efficient or productive. Investigators note the following:

1. Due to high turnover among both nurse aides and supervisory nurses, staff training is constantly needed. During their training, nurse aides cannot be expected to work very efficiently or skillfully with residents.

2. Salaries for nurse aides are very low in an organization with a vertical salary structure (if administrative and professional salaries are considered). This salary structure plus the absence of a nurse aide career advancement path to higher salaries very likely adversely affects both morale and productivity.

3. There are no timely or accurate measures that either supervisors or nurse aides can efficiently use to judge their own daily work performance, which makes feedback for the purpose of reinforcing and sustaining good performance difficult.

4. Supervisory staff trained in management and clinical care are either not present in NHs, do not work directly on the floors, or have multiple jobs exclusive of management. Given the difficulty and importance of assuring that multiple low-paid staff provide consistent care, a full-time supervisor devoted exclusively to nurse-aide management would seem to be minimally necessary to assure high productivity.

In sum, this chapter identified the nurse-aide resources necessary to implement efficacious care processes under highly productive work conditions, which investigators doubt exist in most NHs. A minimally necessary step to improving care is to assure that the required labor resources are available. This chapter provides some guidance about what these staffing resources might be. However, it is very likely that investments in staffing must also be accompanied by improvements in working conditions if the resources are to be effectively used to improve quality.

14.14 Conclusion: Setting Nursing Home Nurse Staffing Standards

14.14.1 Study Question: How Should Appropriateness Be Defined?

This chapter concludes HCFA's Phase 1 report in response to the current concern about inadequate nursing home nurse staffing, and a long-standing requirement for a study and report to Congress on the "appropriateness" of establishing minimum nurse staffing ratios. The Congressional language was clear, but sparse and it was necessary to operationalize "appropriateness" so that there was a study question open to empirical investigation. Consistent with this objective, the analysis presented in Chapters 9 through 12 have defined the key study question: Is there some ratio of nurses to residents below which nursing home residents are at substantially increased risk of quality problems? As we have seen, there is strong evidence supporting the existance of these nurse staffing ratio thresholds, and this finding in turn seemingly provides support for a regulatory minimum ratio requirement. Of course, the appropriateness of establishing a new regulatory minimum would also have to assess the costs, feasibility of implementation, and other considerations which are the subject of a Phase 2 study and report to Congress. What is important to note here is that this conceptualization of appropriateness is what is expected from a regulatory agency; regulatory standards are typically *minimal* standards.

The "appropriateness" of minimum staffing ratios, however, could be defined as the staffing threshold required to attain good or optimal quality outcomes, as opposed to avoiding bad outcomes. As was discussed in Chapter 1, this focus on optimal outcomes is analogous to how this question of appropriate ratios has emerged in education with respect to classroom size. Here the emphasis has been on determining the *optimal (not a minimum)* ratio of students to teachers which has been found to be somewhere around 18 students per teacher, at least for the lower grade levels. Below that ratio no improvement in student performance is observed.

Although the definition of appropriateness implicit in Chapters 9 through 12 as minimal ratios is

consistent with normal regulatory standards, the alternative definition of appropriateness as optimal ratios would seem consistent - even required - by current statutes and regulations. As we have discussed in greater detail in Chapter 4, The Omnibus Budget Reconciliation Act of 1987 (OBRA '87) provided amendments to the Social Security Act (SSA) for Skilled Nursing Facilities (SNF) and Nursing Facilities (NF). The statutory language throughout these amendments and regulations and guidelines promulgated under OBRA '87 placed emphasis upon providing the scope of care and services (including sufficient qualified staff) for a resident residing in a LTC facility to assure that each resident could attain or maintain his/her highest practicable physical, mental, and psychosocial well-being. Hence, it would appear that HCFA's *current* staffing regulations, particularly the general regulation requiring ". . . sufficient nursing staff to attain or maintain the highest practicable . . . well-being of each resident . . .," are intended to provide appropriate care conceptualized as an optimal standard, not a minimal standard.[2]

With respect to what is appropriate nurse aide staffing, the analysis presented in this chapter is consistent with identifying a minimum ratio for attaining optimal quality outcomes. Essentially, the analysis asks how much nurse aide time is required to implement five specific, daily care processes that have been linked to (good) resident outcomes: repositioning and changing wet clothes; repositioning and toileting; exercise encouragement/assistance; feeding assistance; and Activities of Daily Living (ADL) independence enhancement (morning care). The simulation analysis estimates these times for six major categories of residents with different functional limitations and care needs that broadly define the nursing home population. Obviously, these five care processes are not a complete list of what nurse aides must do, and the analysis took into consideration such things as shower assistance, p.m. care, housekeeping duties (e.g., changing bed linens), and random, unscheduled demands for services (e.g., responding to patient call lights, spills, accidents, and similar events).

One key simulation estimated that the average number of *minimal* nurse aide staff necessary to provide all services (i.e., the stated OBRA '87 standard) that can benefit a hypothetical 40 resident unit of average acuity is 14.5 FTEs or 2.9 hours per resident day. This is an estimate of the minimally necessary nurse aide staff to provide optimal care. This standard should be viewed as a necessary condition for optimal care by nurse aides, not a sufficient condition. Obviously, the other licensed categories of nursing, RNs and LPNs are also important, as demonstrated from the findings presented in the previous four chapters. Indeed, the Ohio results for one of the outcome measures that would normally be expected to be more highly related to nurse aide staffing, improvement in resisting care, was in fact more strongly associated with RN staffing. The simulation estimate *assumes* an extremely

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[2]. With the repeal of the Boren Amendment in 1997, it would appear that Congress does not now require that the States Medicaid nursing home payment rates must be sufficient to provide " . . . services required to attain or maintain the highest practical physical, mental and psychosocial well-being of each Medicaid resident . . ." Nevertheless, the OBRA "highest practical" quality standard remains unchanged. See Chapter 2 for a discussion of the Boren Amendment and State Medicaid payment rates.

highly motivated and productive nurse aide staff. Even under conditions of 2.9 hours per resident day of potentially available time, what nurse aides actually do and accomplish with respect to patient care is dependent upon a sufficiently skilled licensed staff to supervise aides as well as other organizational factors.

14.14.2 Strong Evidence

The full evidence in support of this 2.9 hour per resident day optimal nurse aide standard is much greater than what might be apparent from this chapter alone. The analysis presented in Chapters 9 through 12 found an estimated 2.0 nurse aide hours as a minimal or preferred nurse aide staffing threshold. These other analysis lends support to the optimal standard in two ways. First, the differences in the two standards are in predicted direction - we expect the minimal or preferred standard to be less than the optimal standard. Second, the two analyses used entirely different data, methods, and even the outcome measures or domains were different.

The outcomes analysis in Chapters 9 through 12 (a) selected States and facilities, (b) developed facility-level measures of nurse staffing and outcomes, and (c) examined the relationship between the two with logistic regression models. In contrast, the analysis in this chapter essentially synthesized and simulated from a large number of time-motion studies; the nurse aide time (and staffing implications) necessary to perform specific "best practices"care processes. It would be hard to imagine a more divergent approach than found in these two analyses. Yet, the estimated thresholds are not only in the predicted direction, as noted above, but the order of magnitude appears consistent. If the simulation analysis had produced an optimal standard of say - 4 or 5 hours - then we might have to conclude that the differences between the two analysis are due to the different standards - minimal or preferred vs. optimal - or due to differences in data and methods, and we would invoke the usual "more research is needed." Fortunately, the results of these two very different analyses appear remarkably consistent.

14.14.3 Applying the OBRA '87 Standard

As noted in the chapter, the simulation estimate of minimally necessary nurse aide time is much higher than typically found in U.S. nursing homes. But how much higher? In Tables 14.7 and 14.8 below, we have estimated the number of homes that fail to meet this standard. We have utilized a modified OSCAR data set to generate this estimate. As was discussed in greater detail in Chapter 7, this OSCAR file has been created with decision rules that improve the accuracy and reliability of the reported data. As we can see from the table, nearly all nursing homes in the U.S., over 92%, fall below the 2.9 hours per resident day standard. Nearly half of facilities would need to increase nurses aide staffing by 50% or more to reach this threshold, including 16% that would be required to increase nurses aide staffing by at least 100 percent.

- Only 5% of freestanding facilities used 2.9 or more aide hours, and 62% would need to

increase aide staffing by 50% or more to reach this level. The impact was less for hospital-based facilities, but nearly 25% of hospital-based facilities used fewer than 2.9 nurses aide hours, and many of these were well below the 2.9 level.

- Reflecting the lower staffing levels of for-profit facilities, they would be affected more by this proposal than non-profit or government facilities. Nearly 96% of for-profit facilities used fewer than 2.9 nurses aide hours, compared to 87% of non-profits and 84% of government facilities.

- The 2.9 nurse aide hours per resident requirements affects most facilities in every State, but the impact differs across States. In California, for example, 30% of facilities would need to increase aide staffing by 50% of more to reach the 2.9 level, compared to 70% of Texas facilities and more than 80% of Oklahoma facilities (Table 14.7)

Table 14.7: Staffing Levels in U.S. Nursing Homes: Impact of Schnelle Nurses Aide Staffing Requirement (2.90 Nurses Aide Hours per Resident Day), 1998

Facilities	% affected by requirement	Distribution of required increase:						
		#10%	11-20%	21-30%	31-40%	41-50%	50-99%	$100 %
All	0.922	.049	.067	.095	.113	.117	.321	.161
Freestanding	0.950	.041	.063	.093	.115	.124	.344	.170
Hospital-based	0.742	.097	.093	.111	.098	.070	.167	.105
For-profit	0.957	.029	.048	.081	.107	.126	.373	.193
Non-profit	0.866	.079	.102	.120	.128	.101	. 227	.110
Government	0.833	. 108	.097	.127	.115	.094	.218	.073

Note: The minimum nurses aide staffing level suggested by Schnelle is 2.90 hours per resident day (see Chapter 13).
Source: OSCAR

Table 14.8: Staffing Levels in U.S. Nursing Homes:Impact of Schnelle Nurses Aide Staffing Requirement (2.90 Nurses Aide Hours per Resident Day), 1998

State	% affected by requirement	Distribution of staffing increase required for facilities not in compliance						
		#10%	11-20%	21-30%	31-40%	41-50%	51-99%	$100%
AK	0.45	0.18	0.00	0.18	0.09	0.00	0.00	0.00
AL	0.83	0.20	0.13	0.17	0.10	0.06	0.14	0.02
AR	0.94	0.03	0.05	0.04	0.10	0.15	0.51	0.08
AZ	0.88	0.04	0.04	0.10	0.13	0.10	0.42	0.06
CA	0.89	0.05	0.09	0.13	0.16	0.16	0.22	0.08
CO	0.94	0.03	0.09	0.08	0.12	0.12	0.40	0.12
CT	0.95	0.07	0.14	0.17	0.16	0.13	0.14	0.15
DE	0.67	0.04	0.04	0.00	0.21	0.08	0.25	0.04
FL	0.92	0.04	0.08	0.10	0.09	0.15	0.36	0.10
GA	0.95	0.03	0.03	0.10	0.13	0.15	0.43	0.07
HI	0.75	0.03	0.19	0.22	0.19	0.03	0.03	0.06
IA	0.96	0.02	0.01	0.04	0.06	0.06	0.42	0.37
ID	0.69	0.13	0.09	0.11	0.09	0.07	0.18	0.02
IL	0.92	0.02	0.03	0.05	0.05	0.07	0.36	0.33
IN	0.96	0.01	0.01	0.03	0.04	0.04	0.36	0.48
KS	0.97	0.02	0.02	0.03	0.05	0.04	0.42	0.39
KY	0.89	0.04	0.06	0.05	0.12	0.18	0.33	0.12
LA	0.95	0.02	0.04	0.04	0.13	0.16	0.50	0.06
MA	0.93	0.09	0.12	0.18	0.16	0.13	0.20	0.04
MD	0.92	0.04	0.05	0.08	0.16	0.16	0.34	0.09
ME	0.74	0.15	0.22	0.16	0.07	0.07	0.06	0.02
MI	0.91	0.10	0.09	0.16	0.17	0.16	0.19	0.04
MN	0.99	0.02	0.04	0.09	0.14	0.16	0.36	0.18
MO	0.93	0.03	0.03	0.04	0.05	0.06	0.32	0.39
MS	0.93	0.05	0.07	0.10	0.11	0.16	0.30	0.14
MT	0.89	0.11	0.12	0.16	0.11	0.18	0.20	0.01
NC	0.84	0.09	0.10	0.10	0.14	0.09	0.28	0.04

State	% affected by requirement	Distribution of staffing increase required for facilities not in compliance						
		#10%	11-20%	21-30%	31-40%	41-50%	51-99%	$100%
ND	0.91	0.06	0.18	0.19	0.13	0.13	0.20	0.03
NE	0.94	0.01	0.03	0.04	0.10	0.08	0.38	0.30
NH	0.79	0.03	0.11	0.13	0.11	0.21	0.15	0.05
NJ	0.96	0.03	0.08	0.09	0.17	0.17	0.36	0.06
NM	0.87	0.05	0.02	0.04	0.09	0.15	0.42	0.11
NV	0.86	0.06	0.00	0.06	0.03	0.03	0.46	0.23
NY	0.98	0.05	0.11	0.17	0.20	0.12	0.20	0.12
OH	0.93	0.05	0.08	0.11	0.13	0.13	0.31	0.12
OK	0.96	0.02	0.00	0.03	0.04	0.08	0.35	0.44
OR	0.95	0.12	0.05	0.16	0.08	0.13	0.35	0.06
PA	0.92	0.07	0.08	0.12	0.13	0.14	0.32	0.07
RI	0.94	0.09	0.12	0.10	0.14	0.12	0.19	0.19
SC	0.87	0.03	0.11	0.11	0.13	0.21	0.24	0.03
SD	1.00	0.04	0.05	0.06	0.11	0.15	0.53	0.06
TN	0.95	0.03	0.04	0.06	0.11	0.12	0.43	0.16
TX	0.93	0.03	0.03	0.04	0.07	0.07	0.42	0.27
UT	0.90	0.06	0.04	0.13	0.04	0.09	0.33	0.19
VA	0.89	0.04	0.05	0.08	0.08	0.11	0.47	0.07
VT	1.00	0.17	0.14	0.21	0.21	0.03	0.14	0.10
WA	0.81	0.11	0.17	0.12	0.15	0.10	0.12	0.03
WI	0.97	0.05	0.09	0.16	0.16	0.17	0.31	0.03
WV	0.91	0.00	0.06	0.12	0.31	0.17	0.25	0.00
WY	0.94	0.06	0.06	0.16	0.06	0.10	0.42	0.06

Note: The minimum nurses aide staffing level suggested by Schnelle is 2.90 hours per resident day (see Chapter 14).

Source: OSCAR

Of course it should be noted that the 2.9 hour of nurse aide time per resident day estimate is for an *average* nursing home. A nursing home with residents of higher or lower acuity would have a higher or lower threshold, respectively, if this optimal standard is to be met. Hence, the OSCAR data alone

would not be sufficient for identifying this optimal standard for a *particular* nursing home; the threshold would have to be adjusted individually for the case-mix of the facility. Nevertheless, HCFA expects that our improved OSCAR file provides a reasonable estimate of the staffing *distribution* of all nursing homes in the U.S. - a distribution of nursing homes which by definition are in the aggregate of average acuity and functional limitations.

Meeting this optimal standard can also be expressed in the number of required nurse aide FTEs. The 14.5 FTE is equivalent to 2.9 hours per resident day for 40 resident. The average number of residents per certified nursing home is 87.6.[3] For this "average" nursing home, the standard of 2.9 hours of nurse aide time per resident day is equivalent to 31.76 FTE nurse aides. Yet the average staffing level for this "average" nursing home is 22.01. Hence, the "average" nursing home would have to increase its nurse aide staffing by just under 10 FTEs to meet this optimal standard, an increase of about 44 percent.

14.14.4 Is the OBRA Staffing Standard Attainable?

The findings produced here raise serious doubts whether this minimally optimal standard is a realistic goal. Clearly, a very large percentage of facilities fail to meet this standard and they fail by a very wide margin. This failure is compounded when one takes into consideration the 2.9 hours of nurse aide time per resident day as a lower bound estimate for providing all needed care. As was shown in the chapter, the simulations assume very little unscheduled care demands, and what might be considered unrealistic high levels of on-task work performance and productivity for a health care worker. It also assumes a convenient physical layout, and a deployment of staff in what was recognized as an unrealistically efficient manner. More realistic assumptions would clearly raise this lower bound estimate considerably.

In a sense, the stated OBRA '87 standard of staffing to provide the highest practicable well-being has a well-intended, but probably unrealistic goal similar to the "sleeper" clause in the Economic Opportunity Act of 1964 which required the "maximum feasible participation" of the poor in the administration of the Community Action Programs for the War on Poverty.[4] Just as the poverty legislation was silent on the meaning of "maximum feasible participation," the OBRA legislation and regulations are silent with respect to what exactly is required to meet the "highest practicable well-being."; indeed with the repeal of the Boren Amendment, it can be argued that Congress has rejected the cost implications of its "highest practicable"quality standard. On the other hand, as an ideal goal, the much higher staffing

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[3] Unpublished data from OSCAR, current surveys, March 27, 2000.

[4] Kramer, Ralph M., Participation of the Poor - Community Case Studies in the War on Poverty. Prentice-Hall, 1969.

levels found in other countries indicates (see Chapter 3) that it is possible to move a very substantial distance toward this goal.

Appendices for this Report to Congress: *Appropriateness of Minimum Nurse Staffing Ratios in Nursing Homes*, can be found in a separate volume.

References

1. Toepp MC, Kuznets N, Herrera S. Directory of clinical practice guidelines: Titles, sources, and updates (1998). Chicago, IL: American Medical Association.

2. U.S. Preventive Services Task Force. Guide to clinical preventive services, 2nd ed. (1996) Alexandria, VA: International Medical Publishing.

3. National Library of Healthcare Indicators: Health Plan and Network Edition (1997). Oakbrook Terrace. IL: Joint Commission on Accreditation of Healthcare Organizations.

4. The Medical Outcomes & Guidelines Sourcebook: A progress report and resource guide on medical outcomes research and practice guidelines: Developments, data, and documentation (1997). New York, NY: Faulkner & Gray.

5. Neufeld RR, Libow LS, Foley WJ, Dunbar JM, Cohen C, Breuer B (1999). Restraint reduction reduces serious injuries among nursing home residents. J Am Geriatr Soc, 47(10):1202-1207.

6. Evans LK, Strumpf NE, Allen-Taylor SL, et al (1997). A clinical trial to reduce restraints in nursing homes. J Am Geriatr Soc, 45:675-681.

7. Morris JN, Fiatarone M, Kiely DK, Belleville-Taylor P, Murphy K, Littlehale S, Ooi WL, O'Neill E, Doyle N (1999). Nursing rehabilitation and exercise strategies in the nursing home. J of Gerontology: Medical Sciences, 54(10):494-500.

8. McCallion P, Toseland RW, Lacey D, Banks, S. (1999). Educating nursing assistants to communicate more effectively with nursing home residents with dementia. The Gerontologist, 39(5):546-558.

9. Beck C, Heacock P, Mercer SO, Walls RC, Rapp CG, Vogelpohl TS (1997). Improving dressing behavior in cognitively impaired nursing home residents. Nurs Res, 46:126-132.

10. Blair CE (1995). Combining behavior management and mutual goal setting to reduce physical dependency in nursing home residents. Nurs Res; 44(3):160-165.

11. Ouslander JG, Schnelle JF, Uman G, Fingold S, Nigam JG, Tuico E, Bates-Jensen B (1995). Predictors of successful prompted voiding among incontinent nursing home residents. JAMA, 273(17):1366-1370.

12. Schnelle JF (1990). Treatment of urinary incontinence in nursing home patients by prompted voiding. J Am Geriatr Soc, 38:356-360.

13. Schnelle JF, Sowell VA, Traughber B, Hu T-W (1988). A behavioral analysis of the labor cost of managing continence and incontinence in nursing home patients. J Organizational Behav Management, 9(2):137-153.

14. Clinical Practice Guideline Number 3. Pressure ulcers in adults: Prediction and prevention (May 1992). U.S. Dept. of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, Rockville, MD. AHCPR Publ. No. 92-0047.

15. Clinical Practice Guideline, 1996. Pressure Ulcers. Am Med Directors Association.

16. Norton D, McLaren R, Exton-Smith AN (1975). An investigation of geriatric nursing problems in hospital. London: Churchill Livingstone, 238 p. Original work published in 1962.

17. Schnelle JF, Adamson GM, Cruise PA, Al-Samarrai N, Sarbaugh BsC, Uman G, Ouslander, JG (1997). Skin disorders and moisture in incontinent nursing home residents: Intervention implications. J Am Geriatr Soc, 045:1182-1188.

18. Bergstrom N, Braden B, Kemp M, Champagne M, Ruby E (1996). Multi-site study of incidence of pressure ulcers and the relationship between risk level, demographic characteristics, diagnoses, and prescription of preventive interventions. J Am Geriatr Soc, 44(1):22-30.

19. Xakellis GC, Frantz RA, Lewis A, Harvey P (1998). Cost-effectiveness of an intensive pressure ulcer prevention protocol in long-term care. Advances in Wound Care, 11:22-29.

20. Simmons SF, Schnelle JF (1999). Strategies to measure nursing home residents' satisfaction and preferences related to incontinence and mobility care: Implications for evaluating intervention effects. The Gerontologist, 39(3): 345-355.

21. Gustafson DH, Gustafson R (1996). Re-engineering long-term care quality of life improvement. HCFA Report, August: 1-19.

22. Clinical Practice Guideline Number 2, March 1996 Update. Urinary incontinence in adults: Acute and chronic management. U.S. Department of Health and Human Services, Public Health

Service, Agency for Health Care Policy and Research, Rockville, MD. AHCPR Publication No. 96-0682.

23. Clinical Practice Guideline, 1996. Urinary Incontinence. American Medical Directors Association.

24. Schnelle JF (1990). Treatment of urinary incontinence in nursing home patients by prompted voiding. J Am Geriatr Soc, 38:356-360.

25. Creason NS, Grybowski JA, Burgener S, Whippo C, Yeo SA, Richardson B (1989). Prompted voiding therapy for urinary incontinence in aged female nursing home residents. J Adv Nurs, 14:120-126.

26. Hu TW, Igou JF, Kaltreider DL, Yu LC, Rohner TJ, Dennis PJ, Craighead WE, Hadley ED, Ory MG (1995). A clinical trial of a behavioral therapy to reduce urinary incontinence in nursing homes. JAMA, 273(17):1366-1370.

27. Colling J, Ouslander J, Hadley BJ, Eisch J, Campbell E (1992). Effects of patterned urge response toileting (PURT) on urinary incontinence among nursing home residents. J Am Geriatr Soc, 40:135-141.

28. Schnelle JF, Keeler E, Hays RD, Simmons S, Ouslander JG, Siu A (1995). A cost and value analysis of two interventions with incontinent nursing home residents. J Am Geriatr Soc , 43:1112-1117.

29. Schnelle JF, Ouslander JG, Simmons SF, Alessi CA, Gravel MD (1993). The nighttime environment, incontinence care, and sleep disruption in nursing homes. J Am Geriatr Soc, 41:910-914.

30. Cruise PA, Schnelle JF, Alessi CA, Ouslander JG (1998). The nighttime environment and incontinence care practices in nursing homes. J Am Geriatr Soc, 46:181-186.

31. Ouslander JG, Al-Samarrai N, Schnelle JF (In Review). Prompted voiding for nighttime incontinence in nursing homes: Is it effective?

32. Schnelle JF, Cruise PA, Alessi CA, Al-Samarrai N, Ouslander JG (1998). Individualizing nighttime incontinence care in nursing home residents. Nurs Res, 47(4):197-204.

33. Online Survey, Certification and Reporting System (1997). Health Care Financing Administration: Forms 671, 672.

34. Frantz RA, Gardner S, Harvey P, Specht J (1991). The cost of treating pressure ulcers in a long-term care facility. Decubitus, 4(3): 37-45.

35. Ouslander J, Schnelle J, Simmons S, Bates-Jensen B, Zeitlin M. The dark side of incontinence: Nighttime incontinence in nursing home residents (1993). J Am Geriatr Soc, 41: 371-376.

36. Lekan-Rutledge D, Palmer MH, Belyea M (1998). In their own words: nursing assistants' perceptions of barriers to implementation of prompted voiding in long-term care. The Gerontologist, 38(3):370-378.

37. Harke JM, Richgels K (May 1992). Barriers to implementing a continence program in nursing homes. Clin Nurs Res, 1(2):158-168.

38. Council for Nutrition. Nutritional clinical strategies in long-term care (1999). MultiMedia Health Care/Freedom, LLC, Plainsboro, NJ.

39. Health Care Financing Administration. Long-Term Care Facility Resident Assessment Instrument (RAI) User's Manual (April 1999). Minimum Data Set v2. Eliot Press, Natik, MA.

40. Abbasi AA, Rudman D (1993). Observations on the prevalence of protein-calorie undernutrition in VA nursing homes. J Am Geriatr Soc, 41: 117-121.

41. Kayser-Jones J, Schell E (1997). The effect of staffing on the quality of care at mealtime. Nursing Outlook, 45(2): 64-72.

42. Keller HH (1993). Malnutrition in institutionalized elderly: How and why? J Am Geriatr Soc, 41: 1212-1218.

43. Amella EJ (1999). Factors influencing the proportion of food consumed by nursing home residents with dementia. Special Series: Advancing Geriatrics Nursing Practice. Mezey M, Fulmer T. Eds. J Am Geriatr Soc, 47:879-885.

44. Backstrum A, Norberg A, Norberg B (1987). Feeding difficulties in long-stay patients at nursing homes. Caregiver turnover and caregivers' assessments of duration and difficulty of assisted feeding and amount of food received by the patient. Int J Nurs Stud, 24(1): 69-76.

45. Ohwaki S, Zingarelli G (1988). Feeding clients with severe multiple handicaps in a skilled nursing care facility. Mental Retardation, 26(1): 21-24.

46. Hu T-w, Huang L-f, Cartwright WS (1986). Evaluation of the costs of caring for the senile

demented elderly: A pilot study. The Gerontologist, 26(2): 158-163.

47. Steele CM, Greenwood C, Ens I, Robertson C, Seidman-Carlson R (1997). Mealtime difficulties in a home for the aged: Not just dysphagia. Dysphagia, 12:43-50.

48. Durnbaugh T, Haley B, Roberts S (1996). Assessing problem feeding behaviors in mid-stage alzheimer's disease. Geriatric Nursing, 17(2): 63-67.

49. Osborn CL, Marshall MJ (1993). Self-feeding performance in nursing home residents. Journal of Gerontological Nursing, 19(3): 7-14.

50. Phillips LR, Van Ort S (1993). Measurement of mealtime interactions among persons with dementing disorders. Journal of Nursing Measurement, 1(1):41-55.

51. Baltes MM, Zerbe MB (1976). Independence training in nursing-home residents. The Gerontologist, 16(5):428-433.

52. Musson ND, Kincaid J, Ryan P, Glussman B, Varone L, Gamarra N, Wilson R, Reefe W, Silverman M (1990). Nature, nature, nutrition: Interdisciplinary programs to address the prevention of malnutrition and dehydration. Dysphagia, 5: 96-101.

53. Mondoux L (1998). Testimony of the American Nurses Association before the National Academy of Sciences Institute of Medicine Committee on Improving Quality in Long-Term Care, Washington, DC.

54. Blaum CS, Fries BE, Fiatarone MA (1995). Factors associated with low body mass index and weight loss in nursing home residents. Journal of Gerontology: Medical Sciences, 50A(3): M162-M168.

55. Silver AJ, Morley JE, Strome LS, Jones D, Vickers L (1988). Nutritional status in an academic nursing home. J Am Geriatr Soc, 36: 487-491.

56. Siebens H, Trupe E, Siebens A, Cook F, Anshen S, Hanauer R, Oster G. Correlates and consequences of eating dependency in institutionalized elderly (1986). J Am Geriatr Soc, 34: 192-198.

57. Kayser-Jones J, Schell E, Porter C, Paul S (1997). Reliability of percentage figures used to record the dietary intake of nursing home residents. Nurs Home Med, 5(3):69-76.

58. Pokrywka HS, Koffler KH, Remsburg R, Bennett RG, Roth J, Tayback M, Wright JE (1997).

Accuracy of patient care staff in estimating and documenting meal intake of nursing home residents. J Am Geriatr Soc, 45: 1223-1227.

59. Simmons SF, Reuben D (In Press). Nutritional intake monitoring for nursing home residents: A comparison of staff documentation, direct observation, and photography methods. J Am Geriatr Soc.

60. Rogers JC, Holm MB, Burgio LD, Granieri E, Hsu C, Hardin JM, McDowell BJ (1999). Improving morning care routines of nursing home residents with dementia. J Am Geriatr Soc, 47(9):1049-1057.

61. Tappen RM (1994). The effect of skill training on functional abilities of nursing home residents with dementia. Research in Nursing & Health, 17: 159-165.

62. Kihlgren M, Kuremyr D, Norberg A, Brane G, Karlson I, Engstrom B, Melin E (1993). Nurse-patient interaction after training in integrity promoting care at a long-term ward: analysis of video-recorded morning care sessions. Int J Nurs Stud, 30(1):1-13.

63. Williams BC, Fries BE, Foley WJ, Schneider D, Gavazzi M (1994 Summer). Activities of daily living and costs in nursing homes. Health Care Financing Review, 15(4): 117-135.

64. Fiatarone MA, O"Neill EF, Ryan ND, Clements KM, Solares GR, Nelson ME, Roberts SB, Kehayias JJ, Lipsitz LA, Evans WJ (1994). The New England Journal of Medicine, 330(25): 1769-1775.

65. MacRae PG, Asplund LA, Schnelle JF, Ouslander JG, Abrahamse A, Morris C (1996). A walking program for nursing home residents: Effects on walk endurance, physical activity, mobility, and quality of life. J Am Geriatr Soc, 44: 175-180.

66. Friedman R, Tappen RM (1991). The effect of planned walking on communication in Alzheimer's disease. J Am Geriatr Soc, 39: 650-654.

67. Schnelle JF, MacRae PG, Ouslander JG, Simmons SF, Nitta M (1995). Functional incidental training, mobility performance, and incontinence care with nursing home residents. J Am Geriatr Soc, 43:1356-1362.

68. Naso F, Carner E, Blankfort-Doyle W, Coughey K (1990). Endurance training in the elderly nursing home patient. Arch Phys Med Rehabil, 71: 241-243.

69. Schnelle JF, MacRae PG, Giacobassi K, Holden SH, Simmons SF, Ouslander JG (1996).

Exercise with physically restrained nursing home residents: Maximizing benefits of restraint reduction. J Am Geriatr Soc, 44: 507-512.

70. Mulrow CD, Gerety MB, Kanten D, Cornell JE, DeNino LA, Chiodo L, Aguilar C, O'Neill MB, Rosenberg J, Solis RM (1994). A randomized trial of physical rehabilitation for very frail nursing home residents. J Am Med Assoc, 271(7): 519-524.

71. MacRae PG, Schnelle JF, Simmons SF, Ouslander JG (1996). Physical activity levels of ambulatory nursing home residents. J Aging & Phys Activity, 4: 264-278.

72. Schnelle JF, Cruise PA, Alessi CA, Ludlow K, Al-Samarrai NR, Ouslander JG (1998). Sleep hygiene in physically dependent nursing home residents: Behavioral and environmental intervention implications. Sleep, 21(5): 515-523.

73. Holmes D, Teresi J (In Press). Personnel costs in special dementia care units compared with costs on traditional care units. Research & Practice in Alzheimer's Disease.

74. Burke R, Cornelius B. (1998). Analysis of staff time based on HCFA's multistate case-mix and quality demonstration and HCFA's staff time measurement study for the national SNF system. Baltimore, MD: Health Care Financing Administration.

75. Burgio LD, Engel BT, Hawkins A, et.al (1990). A descriptive analysis of nursing staff behaviors in a teaching nursing home: Differences among NAs, LPNs and RNs. Gerontologist, 30(1): 107-112.

76. Hiatt LG (1985). Wandering behavior of older people in nursing homes: A study of hyperactivity, disorientation and the spatial environment. A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

77. Cardona P, Tappen RM, Terrill M, Acosta M, Eusebe MI (1997). Nursing staff time allocation in long-term care: A work sampling study. JONA, 27(2): 28-36.

78. Abdellah FG, Levine E (1954). Work-sampling applied to the study of nursing personnel. Nurs Research, 3(1): 11-16.

79. Edmonds MI, et al (Fall 1999). The use of computer simulation as a strategic decision-making tool: a case study of an emergency department application. Healthcare Management Forum, 12(3):32-8.

80. Dexter F, et al (Jul 1999). Statistical method to evaluate management strategies to decrease variability in operating room utilization: application of linear statistical modeling and Monte Carlo simulation to operating room management. Anesthesiology, Jul;91(1):262-74.

81. Tucker JB, et al (Jan 1999). Using queuing theory to determine operating room staffing needs. Journal of Trauma, 46(1):71-9.

82. Fries BE and Maranthe VP (1981). Determination of optial variable sized multiple-block appointment systems. Operations Research, 29: 324-328.

83. Myers JE, Johnson RE and Egan DM (1972). A computer simulation of outpatient pharmacy operations. Inquiry, 9: 40-47.

84. Hershey JC, Pierskalla W and Wandel S (1981). Nurse staffing management. In Operational research applied to health services (D. Boldy, ed.) New York: St. Martin's Press.

85. Bagust A, et al (1999). Dynamics of bed use in accommodating emergency admissions: stochastic simulation model. British Medical Journal, 17; 319(7203): 155-8.

86. Nadler, Gerald (1970). Work design; a systems concept. Rev. ed. Homewood, Ill., R. D. Irwin.

87. Upenieks VV Work sampling (Apr 1998). Assessing nursing efficiency. Nursing Management, 29(4):27-9.

88. Urden LD; Roode JI (Sep 1997). Work sampling. A decision-making tool for determining resources and work redesign. Journal of Nursing Administration, 27(9):34-41.

89. Bowers B, Becker M (1992). Nurse's aides in nursing homes: The relationship between organization and quality. The Gerontologist, 32(3): 360-366.

90. Alessi CA, Yoon EJ, Al-Samarrai NR, Cruise PA, Schnelle JG (1999). A combined physical activity and environmental intervention in nursing home residents: Do sleep and agitation improve? J Am Geriatr Soc, 47: 784-791.

91. Cohen-Mansfield J, Werner P (1997). Management of verbally disruptive behaviors in nursing home residents. Journal of Gerontology: Medical Sciences, 52A(6): M369-M377.

92. Burgio L, Scilley K, Hardin JM, Hsu C, Yancey J (1996). Environmental "white noise": An intervention for verbally agitated nursing home residents. J of Gerontology: Psychological

Sciences, 51B(6): P364-P373.

93. Camberg L, Woods P, Ooi WL, Hurley A, Colicer L, Ashley J, Odenheimer G, McIntyre K (1999). Evaluation of simulated presence: A personalized approach to enhance well-being in persons with Alzheimer's disease. J Am Geriatr Soc, 47(4): 446-452.

94. Rovner BW, Steele CD, Shmuely Y, Folstein MF (1996). A randomized trial of dementia care in nursing homes. J Am Geriatr Soc, 44: 7-13.

95. Schnelle JF, Cruise PA, Rahman A, Ouslander JG (1998). Developing Rehabilitative Behavioral Interventions for Long-Term Care: Technology Transfer, Acceptance, and Maintenance Issues. J Am Geriatr Soc, 46:1-7.

96. Schnelle JF, Ouslander JG, Cruise PA (1997). Policy Without Technology: A Barrier to Changing Nursing Home Care. The Gerontologist, 37(4):527-532.

97. Walker L, Porter M, Gruman C, Michalski M (1999). Developing individualized care in nursing homes: Integrating the views of nurses and certified nurses aides. J of Gerontological Nursing, (3): 30-35.